

# The Chemical Age

A Weekly Journal Devoted to Industrial & Engineering Chemistry

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**NOTICES:**—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Other communications relating to advertisements or general matters should be addressed to the Manager.

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## Our First Christmas

THIS is the first Christmas THE CHEMICAL AGE has celebrated, and we have to offer to our steadily-growing community of supporters, in addition to cordial greetings for Christmas and the New Year, an equally cordial acknowledgment of the kindly welcome this journal has received on every side. The difficulties inevitable to the establishment of a new publication are now nearly at an end. In our first issue we asked the indulgence of our readers towards the shortcomings of the earlier issues. They have been more than indulgent; they have been appreciative and helpful. Their approval of the features that pleased them has been cordial, and such criticism as we have received has been courteous and obviously intended to help. It would be pretence to claim that THE CHEMICAL AGE during the first six months of its existence has been all we could have wished. It has represented just what was possible in the circumstances. During the new year, however, we shall hope gradually to make good the deficiencies, and especially to develop on the commercial side. In addition to a number of specially contributed reviews of developments during the past

year, to be published in our next issue, we have in hand for early publication a series of original articles by well-known chemists and technologists, and with the improvement in our news-collecting organisation our reports of industrial progress and current events should be fairly complete. We have every reason to be satisfied with the results achieved during the past six months, and with the prospects before us. And for this, once more, our sincere acknowledgments are offered to all our readers.

## Alcohol from Ethylene

MR. ERNEST BURY'S Paper, of which we gave an abstract last week, will be read with a good deal of interest; for, by mastering on a practical scale the conversion of ethylene into alcohol, he has laid the foundation of what might become a very important home industry. It will be remembered that when the report on alcohol was issued last June, by a special Inter-Departmental Committee, it was pointed out that for power purposes alcohol may be used alone so far as comparatively slow engines are concerned. The high-speed motor car engine, however, presents a different problem, and there appear to be difficulties in the way of using the neat spirit. The most serviceable fuel has been found to be that obtained by mixing equal parts of benzene and alcohol, although ether is also suitable for the purpose. The importance of synthetic alcohol will, therefore, be fully appreciated, particularly as, intermixed with the benzol stripped from coal gas, it would provide us with well over 100 million gallons of motor spirit per annum.

The process of producing alcohol from ethylene is by no means new, for well over fifty years ago a company was actually formed for the purpose of manufacturing alcohol from ordinary coal gas. Even in the middle of last century—largely as a result of the systematic research of the famous Berthelot—it was realised that the method was comparatively simple, and it was recognised that the alcohol produced by this means was identical in every way with that derived from the fermentation of sugar. The production of alcohol from ethylene is in reality merely a reversal of the well-known processes whereby alcohol is dehydrated by means of sulphuric acid with the production of ethylene. In fact, theoretically Mr. Bury's method makes use of the well-known principle of producing ethyl-sulphuric acid ( $C_2H_5O \cdot SO_3H$ ) which is yielded when ethylene is absorbed in concentrated sulphuric acid. The ethyl-sulphuric acid then unites with water and gives alcohol ( $C_2H_6O$ ), and sulphuric acid. Thus, the process resolves itself into a direct union of ethylene, and water in the presence of acid acting catalytically. Up to the time of the publication of Mr. Bury's results, the chief difficulty was generally

supposed to be that of arriving at some suitable means of catalytically accelerating the hydration of ethylene, upon which subject there appears to be no published literature.

As regards the extraction of ethylene from the gas mixture, Soddy's charcoal absorption method would seem to offer the most simple practical solution. The whole question, however, must necessarily be influenced by the cost of recovering the alcohol, 1,000 cubic feet of ethylene yielding about 14 gallons of the spirit; but it will be appreciated that whereas coke-oven concerns may extract their valuable hydrocarbons with impunity, the case of town's gas suppliers is very different in view of the standards with which the latter undertakings have to comply. From a national point of view it is clear that the production of alcohol from sources such as coke-oven gas is of immense importance; for, as the spirit is now mainly derived in this country from the fermentation of grain, the new process apart from other national advantages would have some measurable effect on the conservation of our potential food supplies.

### Herbal Remedies and Synthetic Drugs

It will be remembered that during the war the Board of Agriculture gave particularly active encouragement to the growing of herbs by private individuals. The official campaign was productive of a good deal of enthusiasm on the part of amateurs, and many of them will be disappointed to learn that the development of chemistry has practically put an end to the ancient trade of herb-growing. Early in the past century the herb played an important part in medicine, whereas to-day there is little use for it apart from the preparation of such substances as belladonna, aconite and hyoscyamus. When Mr. F. F. Shelley, manager of the Society of Apothecaries, was recently interviewed by the representative of a London paper he remarked that the shortage during the war was in the cheaper variety of herbs, and he suggested that it was in some ways an advantageous shortage, for when herbs were tested physiologically it was found that those which came from abroad were infinitely inferior to those grown at home. In the case of belladonna, aconite and hyoscyamus, it does not matter so much where they are grown because they can be chemically tested for alkaloidal content, and the British Pharmacopæia prescribes an alkaloidal standard.

So far as temporary war shortage was concerned, it was the absence of synthetic drugs that was felt in the early days rather than any serious shortage of herbs. During the last twenty or thirty years synthetic drugs have been used in an ever-increasing proportion, and only such herbs as have had their value substantiated by physiological or biological tests have remained. As an illustration of the manner in which synthetic products have superseded the natural medicine, Mr. Shelley points out that a great number of articles and preparations were eliminated when the previous Pharmacopæia of 1848 was revised in 1914. It was very largely the herbal remedies that were removed and the synthetic ones put in. The value of synthetic preparations is that they have all been physiologically tested before they are introduced, whereas herbal remedies came down to us from the days of empiricism,

when pharmacology was unknown. Not only all manner of herbs but dried toads and dried centipedes as well were used in the olden times as remedies for disease. Dried millipedes, which were taken for certain nervous disorders, were quoted, in fact, in price lists up to the year 1827.

### A New Use for Mercury

It is a common experience in engineering works, and sometimes in chemical factories, for a man's eye to be injured by small particles of metal which become embedded in the cornea of the eye and cases are not uncommon where permanent injury or loss of sight is the result. In the case of particles of steel or iron the usual practice is to remove them by means of a powerful electromagnet placed close to the eye, which is usually sufficient to extract them. This method is not applicable to non-magnetic metals, and in this connection an experience of Mr. E. J. Crane's, related in a recent issue of *The Journal of Industrial and Engineering Chemistry*, will be of interest and may be of use when similar circumstances arise in any of our readers' works. In the case under discussion, numerous fine particles of metal were embedded in the cornea and it was not considered possible to remove them mechanically. Softening the cornea proved unsuccessful, and after three weeks the patient's condition became serious. The problem was solved by the application of mercury applied by means of an eye cup, which removed the metal by amalgamation within two weeks and after repeated applications. The mercury used had been previously purified by treating it with dilute nitric acid and redistilling it.

### The Calendar

Jan.		
7	Birmingham and Midland Institute. Scientific Society Annual Soirée.	The Institute, Birmingham.
8	Society of Chemical Industry (Bristol & South Wales Section): "The Chemical Technology of the Tanins." M. Nierenstein, Dés Sc. 7.30	Chemical Department, Woodland Road, The University, Bristol.
9	Society of Chemical Industry (Manchester Section): "A New Instrument for the Measurement of Vapour Tension." H. Moore, M.Sc. 7 p.m.	Grand Hotel, Manchester.
13	Society of Chemical Industry (Edinburgh and East of Scotland Section): Informal Meeting.	Edinburgh.
15	Association of Engineering and Shipbuilding Draughtsmen (Chesterfield Sub-Branch): "Gas Cylinders." F. S. Marsh, M.S. 7.30 p.m.	Grammar School, Chesterfield.
15	Society of Dyers and Colourists (Bradford Junior Branch): "Utility of General Science to the Dyer." Dr. L. L. Lloyd.	Bradford.
15	Chemical Society: Ordinary Scientific Meeting. 8 p.m.	Burlington House, Piccadilly, W.
16	Society of Dyers and Colourists (Manchester Section): "Sulphonation of Fixed Oils." L. G. Radcliffe, Miss E. Bramwell and S. Medofski.	Manchester.
22	Society of Dyers and Colourists (West Riding Section): "The Application of Electricity in the Dyeing Industry."	

## Chemists' Salaries

To the Editor of THE CHEMICAL AGE

SIR.—Having read the request of your correspondent and your comments on "Chemists' Salaries" in your issue of December 20, may I through your pages call the attention of your correspondent and of others in sympathy with his views to the existence of the British Association of Chemists. This Association has as its chief objective the improvement of the economic status of the properly qualified chemist. By co-operation and proper organisation only is this end likely to be attained. If chemists interested will write, full particulars of the objects of the Association will gladly be sent.—Yours, &c.,  
Bedford House, S. REGINALD PRICE,  
8, York Place, W. Gen. Sec. B.A.C.

To the Editor of THE CHEMICAL AGE

SIR.—It would be a difficult matter to write a strong article, as your correspondent suggests, on the above subject as brought to notice in the current issue of THE CHEMICAL AGE, because the profession appears to be so made up of "affluent" men and "non-affluents." Many of the former work for the love of science, and prejudice the majority, who have taken up the science as a livelihood. I think I can go one better than your correspondent. In 1896, at the age of 24, I earned £3 a week after having left college for three years; in 1898 I earned £3. 10s., and the average remained at this figure till 1912, when it jumped to £4 a week, remaining so till 1915, when the demand for trained chemists was greater than the supply, and I obtained a managership for £5 a week! The war being over, of course, the chemist is thrown on to the heap of the "unemployed," and deprived of the "dole" and all means to keep up the tone of the profession. "A rolling stone," it is said, "gathers no moss," and my being a rolling stone is because proper reward cannot be obtained equal to the experience gained, and the responsible positions held in the last twenty-five years.

If you are writing a further editorial on the subject, no doubt my experience can be commented upon if necessary. I have been "on the fence" now a whole year since the Armistice, and, being over 45 years of age, find it most difficult indeed to find other openings.—Yours, &c.,  
B. B. B.

## Reviews

EFFICIENT BOILER MANAGEMENT. By Chas. F. Wade, A.M.I.E.E. Longmans, Green & Co., London, 1919. Pp. xiv., 266. 12s. 6d. net.

Next to power stations, and perhaps collieries, chemical factories are probably the principal users of steam, but it is notorious that in the past the efficiency of their boiler plant has been relatively low. Low fuel costs and the fact that fuel is not always the principal item in the cost of production may account for this, but the present high price of fuel and the national necessity for strict economy will inevitably react upon the chemical industry, and particularly in the case of the smaller works, will lead to re-organisation and thorough control of boiler installations. The present volume, therefore, appears at a very opportune moment, particularly as it is a judicious combination of the elementary scientific principles of steam raising and of the systematic application of these principles to obtain the most efficient results, and is written in a way that the average engineer or works manager will understand.

Chapters XIII. and XXI., dealing with the maintenance, organisation and equipment of boiler plants are especially useful, the latter including complete sets of charts, tables, &c., suitable for continuous record of performance. Chapter XIX. deals with coal-handling plant and deterioration of coal in stock, and rightly draws attention to the advantages of ferro-concrete for storing moist coal, steel bunkers being liable to corrosion. The use of ferro-concrete in chemical factories is really in its infancy and should find application in other directions. The control of boiler plant has received insufficient attention in the past from the works chemist and chemical engineer. Under modern conditions it is almost unthinkable

that a continuous process should not be under continuous and accurate scientific control, and yet, although in the words of Professor Hinchley, a boiler is really only a "continuous high pressure still," the boiler house in chemical works has only too often been left in charge of a foreman. While the services of an expert may be needed in selecting and installing the necessary plant, Mr. Wade's book should certainly stimulate economy and efficiency, and in spite of a few obvious errors in the Chemistry of the subject it should find a place on the bookshelf of works managers and directors.

C. J. GOODWIN.

CHEMISTRY FROM THE INDUSTRIAL STANDPOINT. By P. C. I. Thorne, B.A., with an introduction by Dr. H. V. A. Briscoe. Hodder and Stoughton. 4s. 6d. net.

This little volume is one of a series the aim of which is to present a number of technical subjects in a simple yet moderately complete manner. As may be imagined, no very detailed account of the intricate processes connected with industrial chemistry can be crowded into 200 pages, but the author has made exceptionally good use of his space, and even the trained chemist will come across interesting facts out of his particular line. The book should be of primary use to the youth still at school, for it will enable him to appreciate the methods employed in chemistry, and should stimulate a desire to pursue the subject further. Evidently the author has this object in view, for he gives a useful list of books bearing more fully on those subjects which he himself has dealt with in outline.

In his introduction Dr. Briscoe does not attempt to conceal the fact that the present position in this country as regards industries dependent upon the application of science is unsatisfactory. The real trouble, he says, is that there exists no common ground of understanding upon which the scientist and business man can meet. The main reason for this undoubtedly lies in the fact that the average commercial man knows little of science and is unable to appreciate its value. On the other hand, the technical man has partly himself to blame in that he permits himself to become so intent on his subject that he has no eyes or ears for business matters. Occasionally, one comes across the ideal combination of science and business capacity, but the rarity of such individuals is the natural legacy of our present system of education.

Mr. Thorne has endeavoured to bring home to his readers the concepts of chemistry by illustrating their connection with everyday phenomena with which the majority are familiar. He has certainly interwoven pure and applied chemistry in a novel and engaging manner; and, in view of the purpose for which the book is intended, it is not necessary to review critically the technical descriptions given.  
A. M.

ON SATURDAY, at a general meeting of the North of England Section of the Coke Oven Managers' Association, Mr. A. H. Middleton, Consett, read a Paper on "The Construction of Coke Ovens."

AT A MEETING of the Huddersfield (Yorks) Chamber of Commerce on December 19, a complaint was received from a local firm as to its inability to get alkali delivered from Northwich by rail, because of the shortage of trucks. Mr. R. C. Walshaw said that while complaints of railway delays were general, Huddersfield was in a worse position than most towns, and he suggested that representatives of the Chamber of Commerce, Chamber of Trade, and Corporation should form themselves into a permanent committee in order to see whether something could not be done. The proposal was agreed to unanimously.

AN INTERESTING PAPER concerning gas furnace installations was read by Mr. H. R. Hems (Industrial Research Laboratory, Birmingham Corporation) at a meeting of the Midland Junior Gas Association at the Council House, Birmingham, on December 18. Mr. Carrington Barber presided. The author urged that it was patent to anyone who had been in a workshop where coal, coke or oil was used as a fuel, and then saw similar work done by means of gas furnaces, that the latter held the palm for cleanliness, simplicity of control and quality of work. As a fuel gas was to-day largely used in the Midland glass industry. One of the most important applications of gas to industry was in connection with the nut and bolt trade—high-temperature furnaces for forging of steel and wrought-iron bars, and the results were entirely successful. The number of such furnaces was growing rapidly in the "Black Country."



## The Institute of Chemistry

### Representation of Chemists on Whitley Councils

FROM "Proceedings" of the Council of the Institute of Chemistry for the past six months (Volume IV.), it appears that several matters of importance have been under consideration. It is satisfactory to learn that several offers of assistance have been received in connection with the proposed preparation of an account of the services rendered by chemists during the war, and an appeal is made to Fellows and Associates who are willing to help.

### Patents and Designs Bill

On the subject of the Patents and Designs Bill, the Council express their concurrence with the Report of the Patent Laws Committee of the Conjoint Board of Scientific Societies in advocating the following improvements in British Patent Law:—

- (1) The extension of the present period of provisional protection.
- (2) The extension of the period of protection from 14 years to 17 years, as in the United States.
- (3) A reduction in the scale of fees. The present fee for the first four years should remain, and all renewal fees should be substantially reduced.
- (4) The adoption of the "File Wrapper" system, as employed in the United States.

### Chemical Glassware, etc.

The Council have received a letter from the Department of Scientific and Industrial Research asking for an expression of their views with regard to present supplies and quality of British-made chemical glassware and of fine chemicals for research purposes. The Glass Research Committee of the Institute is inquiring into the first matter and invites the views of Fellows and Associates thereon. The Council understand that the question with regard to fine chemicals is under the consideration of the Federal Council for Pure and Applied Chemistry.

The Joint Committee of the Institute of Chemistry and the Society of Public Analysts, under whose direction a List for Reagents for Analytical Purposes was published in 1915, have under consideration the desirability of revising and extending the List referred to, provided a sufficient number of manufacturers are prepared to produce "A.R." chemicals according to the standards specified. It is probable that the Committee will proceed with the revision of the List, and they will be glad to receive suggestions from the Fellows and Associates in that matter.

The Lords Commissioners of H.M. Treasury, on the suggestion of Sir James Dobbie, have requested the President of the Institute to serve on a Committee which is to deal with the selection of temporary chemical assistants in the Government laboratory, the other members being the Government Chemist and a representative of the Civil Service Commissioners.

### Economic Interests of Chemists

Acting on a suggestion received from the London and South-Eastern Counties' Section of the Institute, the Council issued a circular with "Proceedings," Part III., in order to collect information with regard to the salaries received by chemists in various branches of work.

No authoritative figures had previously been available to gauge the general rate of remuneration, the available data being insufficient as a basis for possible propaganda. In order to supply this deficiency, the Council decided to ask members in receipt of salaries for whole-time appointments, apart from those occupying independent positions, to fill up and return a form, indicating age, branch of work, nature of position, locality, term of appointment, salary, war bonus or other allowance, prospects, leave and conditions of appointment.

Returns have been received from about 950 Fellows and Associates, and the statistics prepared therefrom have been submitted to the General Purposes Committee. The Committee are of opinion that the figures obtained up to the present probably indicate a lower average than that of the actual rate of pay received, because the less satisfactory returns are apparently more strongly represented in the replies, while a large proportion of the more fortunate members seem to have neglected to supply information.

The Council request, therefore, that members who have not yet sent in the forms will do so as soon as possible and thereby assist the General Purposes Committee in their investigation in the interests of the profession.

### Chemists and Whitley Councils

A full account is given of the negotiations with the Ministry of Labour respecting representation of the Institute of Chemistry, as representing the profession of chemistry, on Committees of the Industrial Council and on the National Industrial Council. The Institute's statement of the case included the following points:—

"While technical men require representation as much as any other class, the Trades Unions are inclined, in some cases, to distrust such men as being allied to the employers, and for that reason do not at present wish to see them associated with the unions. In some industries the workman is said to suspect expert technical men, who introduce new processes and inventions, as being inimical to Labour,

and means should be found for bringing about a change of view and promoting co-operation for the general good.

"The representation of chemists on the Industrial Council of any industry is rendered somewhat difficult owing to the small number of chemists engaged. In only one or two industries can they be counted by hundreds: iron and steel, dyes, and lately, explosives. The varying standards of competence and the varied nature of their work make it impossible to fix any flat rate of pay; for this and other reasons the possibility of a general strike is remote. An attempt might be made, to fix minimum rates, but for the present defence organisation is limited practically to chemists declining appointments with concerns in which the pay is inadequate or the conditions insupportable. Some method of dealing with the matter must be found, in order that chemists, in common with other employees, may have their interests safeguarded. Otherwise, the profession which is of such vital importance is liable to become degraded and unattractive.

"Seeing, however, that the Institute represents the trained and competent chemists of the country—both employers and employed—it does not seek recognition as a Trades Union; but it is prepared to act in an advisory capacity in any matter affecting the welfare of chemists, and is willing to assist the Ministry in technical matters proposed to be dealt with under the Whitley Report. The Institute, moreover, would co-operate with the Ministry in any scheme which may be devised for popularising science, having in view the distrust referred to above."

Further discussion took place on the steps to be taken to secure representation of chemists on the Industrial Councils. As the numbers of chemists employed in various industries are not sufficiently great to ensure representation solely on that ground, it is more likely, the Council state, to be attained by bringing the industries concerned to realise the importance of chemical science. There are signs in certain trades that objections to the representation of men in the management, technical staff, &c., will be waived. It is possible that chemists may secure representation in such industries either as representing the management or as chemists. The Industrial Councils, moreover, have the power to co-opt persons with technical knowledge and experience, and when chemical problems arise opportunities will occur for chemists to suggest that their profession should be represented on the Industrial Councils concerned. It appears necessary that propaganda should be promoted with the object of encouraging the further employment of scientific methods and, therefore, of scientific men in industry, and it is suggested, for instance, that, in the Institute's scheme of lectures on technological subjects, employers and men connected with the industries concerned should be invited; that the chemists should ensure that their work receives greater attention in the technical press of various industries, and that scientific development should be brought before the notice of Industrial Councils, so that both employers and men may realise the bearing of science on industry.

### Chemists in War

The Joint Committee of the Institute of Chemistry and the Institute of Metals, which has under consideration the position of chemists and metallurgists in the Services and in the Reserve, and the action to be taken towards securing for them due recognition and adequate status, has received information from various sources with regard to the position of officers (chemists and metallurgists) attached to the Navy, R.A.O.C., R.E. (Special Brigade and I.W.T.), R.A.M.C. and the R.A.F. They are of opinion that there is ground for complaint that the status of chemists and metallurgists is inadequately recognised in official quarters and that this is mainly due to the lack of appreciation of the technical nature of the work of such officers and of the scope and character of the education and training required for the practice of chemistry and metallurgy. The Committee apprehend that, notwithstanding all the scientific service rendered during the war, there is a danger that the vital importance of such service to the State will be overlooked, unless the Government Departments concerned can be brought to realise the right and claims of science and of scientific men. The Committee are investigating the matter and will report in due course.

### Engineering Standards Association

In response to an invitation from the British Engineering Standards Association to nominate a representative to serve on the Aircraft Sub-Committee on Chemicals of the Association, the Council have asked Mr. F. W. Harbord, C.B.E., to act in that capacity. As, however, the reference to the Sub-Committee includes matters relating to organic materials, Mr. Harbord has asked that a second representative be nominated, and this suggestion has been forwarded to the Association.

OWING TO THE CONTINUED INCREASE in membership of the Manchester Chemical Club, the present premises have been found unsatisfactory, and it has been necessary to transfer the membership of the Club to the Manchester Literary and Philosophical Society (36, George Street, Manchester)—one of the oldest scientific societies in the country—of which a chemical section has been formed from the former club members.

## Zirconia

### Mr. H. E. Coley on Its Industrial Applications as a Refractory

AN interesting Paper on the refractory, Zirconia, in relation to industry, by Mr. H. E. Coley, London, was read by Mr. Ramsden, before the members of the Birmingham Metallurgical Society, at the Chamber of Commerce, on Thursday, December 18.

There was a good attendance, over which Mr. F. C. A. H. Lantberry (Chief Chemist, Birmingham Small Arms Co.) presided. He urged that the metallurgical and ceramic industries were greatly in need of better refractory materials.

#### The Vital Question of Cost

The author said if one assumed that the earth zirconia was the almost ideal refractory material, why was it not largely used in the metal industry? The commercial man said the cost was too high; he was not, however, concerned with the statements that zirconia formed carbides and nitrides readily, and indulged in other complex reactions. The two principal sources of zirconia ore were the oxide of zirconia plus gangue, and zirconia silicate, known as zircons. There had not as yet been devised a process with a cost production figure low enough to warrant pure zirconia oxide being used for refractory bricks in the furnaces, and therefore it was improbable that pure  $ZrO_2$  refractory bricks would be available for the metal industry. It was obvious that the  $ZrO_2$  must be cheapened either by leaving some of the impurities with it or adding other materials of an inoffensive character.

Showing samples of zirconia which had been through an operation for the removal of the iron and free silica (and which had a breaking down point under heat at a temperature of  $2300^\circ C.$ ), the author said the whole question of the use of zirconia on a large scale and for heavy furnace work depended on the question of cost. Given a brick having a softening point of  $2300^\circ C.$  and none of the objectionable qualities of other refractories—could the metallurgist afford to use it? Zirconia was somewhat like a sharp sand, and the problem of plasticity had been largely solved. Zirconia in common with most other refractories could be influenced as to its shrinkage by the addition of grog, i.e., pre-burnt and ground zirconia. The essential point was that the grog should have been fired to the same temperature as that to which the bricks were to be fired. The firing temperature was not governed by the melting point of the material, but by the temperature of employment. The grog firing temperature was determined by the kiln firing temperature, and the kiln firing temperature was determined by the temperature of the furnace in which the zirconia shapes were going to be worked.

It was worthy of note that there was not any appearance of the hackly fracture one would expect from the addition of grog, except where vitrified grog had been added, and then these granules were a source of weakness, not strength. The ground grog completely united the raw material, and a homogeneous and plain structure results which tended to strength.

#### Formation of Carbides during Firing

The gas furnace was suitable for the firing of zirconia brick shapes. Much had been said, observed the author, about the formation of carbides of zirconia during firing, but there was not any evidence that those carbides formed below fusion point. The mistake had probably arisen on account of the curious capacity of zirconia to absorb carbon. Black bricks could be obtained by firing the zirconia bricks in a strongly reducing atmosphere, carbon monoxide being freely available with the result that carbon deposited in the zirconia bricks gave a black colour. That colour might be completely removed by firing in an oxidising atmosphere. The point had been raised: could the zirconia material from which the various shapes were made be used in situ? If the material could be shaped to the furnace requirements on the spot without the manufacture of special shapes, the cost would be materially decreased. The answer was that that could be done, but it must not be expected that the zirconia material was going to set under such conditions without cracks appearing. With adequate preparations a workable job could be obtained. A highly finished zirconia-built furnace must be properly designed in sections, made in those sections, baked separately and accurately fitted together.

The position of zirconia—which the war brought forward and had held back—was to-day as follows: A zirconia material could be produced which so treated could be moulded into any suitable shape; the shapes could be baked to present a workmanlike finish and surface; and when so baked the shapes had a melting point, not less than  $2300^\circ C.$ , a low coefficient of expansion, a low conductivity; a resistance to slags better than other refractories; the property of being heated and cooled alternatively and rapidly without deterioration; and a capacity to resist very great pressures cold, and a greater pressure hot than other refractories.

As to zirconium as a metal and an ingredient in alloys, he could not give any useful information, because the effects of the results obtained were not yet established. The work was embryonic.

During the war we were told that the great German guns were made of zirconium steel. Our American Allies found out all about it quickly, and after that there was little news. Ferro-zirconium was made and could be made, and some day the real inwardness of the application of zirconium as an alloy would be established. But he asked them to remember that if it was an ingredient in the manufacture of German armour plates, and it might have been, it could not be found therein. Released from its bondage with oxygen it was a wayward and difficult material. If it could not have its oxygen it would take nitrogen in exchange, or silica. In short, it was an excellent scavenger, and therein perhaps was its ultimate destination. The production of ferro-zirconium was in fact only the beginning, and not the end of the matter.

#### Discussion

Mr. BRADFORD thought the chief disadvantage of zirconia for commercial use lay in the question of cost. Were there good supplies in Brazil? The extraordinary advantages of zirconia over the ordinary well-known refractories were so much greater that even an enormously higher initial cost might in the end be the more profitable, although the difficulty would be to make manufacturers realise that. He believed that a semi-purified zirconium ore would be adequate for ordinary commercial purposes.

Mr. H. HAYES believed that zirconia would be a great improvement on present refractories, most of which gave way and caused delays in the furnaces for the melting of nickel and nickel silver alloys.

Mr. A. E. BROUGHALL commented upon the wonderful properties of the refractory, and urged that if it did what was claimed, cost would not prevent its use. Cost did not restrict the use of high-speed steel.

Mr. A. BRAZINETZ inquired how many heats, with brass, could be done with the same crucible.

Mr. J. E. LESTER said he wanted to see where this rare earth was leading—whether its use was likely to become a commercial proposition, or whether it was to be merely academic.

Mr. RAMSDEN, in reply, said the cost of zirconia was not anything like double that of the other refractories, while the life of it was probably ten times greater than most, and four times greater than the best. The linings of crucibles would not be of zirconia alone; the mixed material had a larger life. Severe tests placed zirconia a long way ahead of the best refractories. A perfect bend was obtained by applying the cement wet, such being of the same material as the brick. Zirconia was porous to water, but not to salt, and they were not aware that it absorbed metallic fumes. There was no shortage in Brazil of the zirconia earth. Spraying zirconium preparation on firebrick was not effective; what was wanted was a nice working face on the lining. With the material plastic, cracks after six heats were easy of repair; there was not that glazing as with ordinary refractory material. It was not necessary to line the lids.

To the author and Mr. Ramsden a hearty vote of thanks was passed.

### Manihot Seed and Oil

THE manihot, a well-known rubber plant in Brazil has not hitherto been considered as a very valuable source of vegetable oil. The Germans, however, in their desperate search for oil from any quarter, have turned their attention also to this plant. They planted large areas of manihot in German East Africa for the production of rubber, and they now propose to consider seriously the possibility of obtaining oil from the plant.

In 1917 the Institut für angewandte Botanik (Institute for Applied Botany) received samples of three varieties of manihot from a Hamburg firm, and the Institute's examination of these three samples has just been published. The following table gives the percentages of shell and oil in the seed:—

	M. glaziovii, per cent.	M. dichotoma, per cent.	M. pia- hyensis, per cent.
Shell .....	73.25	68.25	74.25
Kernel .....	26.75	31.75	25.75
Oil in kernel .....	41.34	46.14	48.05
Oil in whole seed, .....	11.06	14.05	12.01

Technical manihot oil was prepared from a mixture of 67 per cent. dichotoma, 30 per cent. piahyensis, and 3 per cent. glaziovii unshelled manihot seeds, the yield by extraction being 13 per cent. On the basis of the figures given above the theoretical yield should amount to 14.15 per cent., and an analysis of the residue showed an oil content of 1.3 per cent. The fatty acids are hard and of brown colour. This technical or unrefined oil is chiefly used in the manufacture of varnish and soap. The residual cake is said to be a valuable cattle food.—"Times" Trade Supplement.

## Gas Producer Reactions

### Dr. J. H. Paterson's Dissent from Text Books

DR. J. H. PATERSON, at a meeting of the Newcastle Section of the Society of Chemical Industry, on Wednesday, December 17, gave an address on "The Theory of Gas Producer Reactions, with Special Reference to the Rate of Gasification." Professor P. P. Bedson presided.

The Chairman announced that the invitation of the Newcastle Section to the Society of Chemical Industry to hold its annual meeting next year at Newcastle had been accepted. He described the steps which the Committee had already taken with regard to preparing for the visit, and added that the Lord Mayor would be approached regarding the civic welcome to the conference. It was 15 years since the meeting had been held in Newcastle, and he hoped that the members would co-operate in making next year's meeting an even greater success than that was. He proposed that thanks be accorded to the Newcastle Gas Co. and the Bede Metal Works Co. for allowing a party of members to pay visits to the works. This was carried. The annual meeting of the Society will be held in July, but the date is not yet fixed.

### Ash-Free Fuel

Dr. Paterson said he intended to prepare an exhaustive Paper on the subject at an early date, and his present purpose was merely to give an informal dissertation on the question. Describing the elementary principles of gas producers, he said that for some inexplicable reason all text-books on the subject invariably assumed that there was a certain series of reactions taking place in a gas producer. He did not agree with some of those assumptions. He exhibited a number of curves and suggested that on thermic grounds a gas producer having separate oxidation and reduction zones was improbable. He held, despite the text-books, that the first product of the reaction between the carbon and the air was carbon monoxide alone. Economically speaking, a gas producer burning fuel at high rates, say, from 50 to 100 lb. per square foot of grate area per hour, was preferable to a low-duty producer in that the capital cost of the plant was less and the upkeep and labour cost considerably reduced. High-duty gas producers must of necessity be supplied with fuel of low ash content, and a problem of the immediate future was the economical production of an almost ash-free fuel.

"The more I deal with coal," said Dr. Paterson, "the more am I convinced that the question of eliminating or reducing ash should be dealt with not when it reaches the furnaces but at the colliery. I know of cases where it is costing us, to 10s. a ton to get rid of the ash, and under favourable circumstances where the works are near a river it is costing about 3s. per ton." If the ash could be got rid of at the colliery there would be an enormous saving in the cost of boilers, labour and time. There was no doubt that efficient washing machinery at the collieries would prove a saving and benefit to the consumer. He believed the consumer could be educated up to the idea of paying more for coal almost free from ash.

### A New High-Duty Producer

Dr. Paterson excited considerable interest by a description of a high-duty producer designed by Col. J. D. Smith. The producer was intended to supply gas for the propulsion of vehicles having internal combustion engines. He showed a photograph of a large motor lorry fitted with the producer which had actually run thousands of miles. The producer, according to the photograph was a very small compact piece of machinery, occupying very little space. It was worked on the suction principle with a high rate of fuel consumption, from 80 to 90 lb. per square foot per hour. It was entirely automatic in action and had a flat bar grate of the shaking type which had proved efficient under trial. He was of opinion that the time was not far distant when gas producers of that type would be quite common.

In the course of the discussion, the chairman said he, too, was looking forward to the time when they could have an ashless fuel. He reminded the meeting of the lady who, on being introduced to a colliery owner, said, "I'm glad to meet you; I should have thought you were the owner of a slate quarry." (Laughter.) The motor fitted with the gas producer appealed to him as a remarkable achievement, both from a chemical and engineering point of view. It pointed to the truth of Dr. Paterson's assertion that the first production was carbon-monoxide. The other reactions which were said to take place were, he was afraid, products of the mind.

Mr. H. Walker said he thought he knew a good deal about gas producers, but he had learnt more in an hour than ever he had in such a short space of time before.

Mr. A. Short said he had learnt even more than the first speaker, for he knew nothing of gas producers when he came to the meeting.

### Criticism of Engineering Group Papers

Mr. J. Duncan remarked that he had listened to all the Papers at the Chemical Engineering Group Conference on the Monday, and he considered that Dr. Paterson's Paper had been more useful and interesting. Everybody at the conference had the best pump produced. (Laughter.) The Paper or speech of Dr. Paterson had set

them thinking more than all the Papers on Monday. He asked whether it was a common practice to pre-heat air or steam before introducing them in the furnace, and whether there was any specific difference in the kind of clinker produced when using air as against air and steam.

Mr. W. G. Carey said he agreed with Dr. Duncan regarding the conference on Monday. It might be assumed, after hearing the speakers, that all one had to do was to go home and operate the works by telephone. (Laughter.) He thought that Dr. Paterson had quite upset the theories on reaction commonly accepted. The small gas producer used on the motor in particular had appealed to him as bearing out the speaker's statements. He would like to ask whether Dr. Paterson thought there was much in the idea of adding lime to the coal to increase the yield of ammonia.

Dr. Paterson, in replying, said he would rather not say anything regarding the clinker problem as it was worthy of a Paper in itself. Replying to Mr. Duncan, he said that air was pre-heated in some types, the Mond, for instance. When using producers for furnace heating, he did not think there was any object in it. Superheating the steam was a wise plan, which he would adopt in building a producer. He did not place much faith in adding lime to increase the ammonia yield. It was useful to remember that a blast furnace was one of the most efficient gas producers, although the production of gas was not the primary object. He hoped, when his Paper on the subject was completed, to deal fully with many of the points raised.

## The Society of Chemical Industry

### Bristol and South Wales Section

A PAPER was read by Mr. W. R. Bird at the last meeting of the Bristol and South Wales Section on "Fractional Distillation in the Laboratory and in Practice." A number of forms of apparatus for laboratory fractionations were described and their efficiency compared. One very general fault was noted which seriously impaired the utility of any column giving rise to flooding. This fault consists in a reduction in diameter of the tube which enters the flask, this in some cases being the narrowest portion of the whole column, while it should be the widest. The plain tube filled with glass beads makes quite an efficient column if the beads are supported by a wire instead of constricting the tube for this purpose; the bottom end of tube is thus kept full size. The wire is bent at the lower end to a small circle, a few beads threaded over it, then suspended by a hook in the side tube, so that the wire hangs centrally when the rest of the beads are put in round the wire. An account of the results obtained using the form of column described in the *Journal* of the Society of Chemical Industry for August, 1918, was given. Provided this apparatus (consisting of two concentric glass tubes with a spiral wire occupying the annular space) is used with careful gas regulation and in draught-free room, the separation is the most useful hitherto effected by laboratory apparatus.

Vacuum distillation did not, in the opinion of the speaker, have any effect in improved separation; only a general reduction in boiling point, a point to be considered very carefully where waste heat might be employed for distillation. Fractional distillation in the factory is easier than in the laboratory; even a plain still by careful regulation of speed yields fair results. A plain tube with packing may be used. Whatever type of packing is used it must be uniform in size and supported at intervals to prevent crushing of the lower layers; also sufficient space must be provided for passage of vapour and liquid. In shell or bubbling tray columns, instead of surface contact only, evaporation is made use of, a method leading to purer products. Columns provided with trays having vapour nozzles and hoods provide a very efficient fractionation; it is an error to make trays too shallow, for this leads to contamination by spraying; 1 ft. 6 in. was found to give very excellent results. Also the depth of seal may be greater than is usually considered advisable; up to 3 in. may be used. Overflow pipes must be large. The retention of a considerable quantity of heavy product in the trays at the end of the distillation, if found to be disadvantageous, should be remedied by providing a trap for each tray to empty them. The best results are obtained by adding a dephlegmator to the column, which steadies the working and with efficient lagging of the column allows of much greater speed of working. The apparatus should be thermometrically controlled at the base of the column and the outlet of dephlegmator, which is preferably constructed in sections to permit of fractional condensation with return of liquid to different trays in the column.

The next Paper will be on "The Chemical Technology of the Tannins," by Dr. Nierenstein, on January 8, at 7.30 p.m.

THE BRITISH DYESTUFFS CORPORATION, LTD., announce that after December 25 the address of their London office will be Imperial House, 17, Kingsway, London, W.C. 2. The telephone number will be Regent 3,371, and the telegraphic address "Bridalta, Westcent, London." The office will be closed from Friday, December 19, to Monday, December 29.



## "Disintegration"

**A Paper by Mr. W. A. Barron, M.I.M.M., F.R.S.A.**

AN interesting lecture upon "The Disintegration of Ores, Rocks and Similar Hard Materials" was given by Mr. W. A. Barron at the Manchester College of Technology, on Tuesday, December 16.

Mr. Barron began his lecture by stating that in blasting ore or rock in mine or quarry the first stage of crushing might be said to be performed. High power explosives broke rock much smaller than those of low power and lessened work by the hammer and the rock breaker very materially. This might not, however, always be an advantage, depending upon the size to be finally attained as well as upon the nature of the rock. Where high-power explosives were objectionable, on this account lower power explosives were adopted. Lumps of ore too large for feeding to a rock breaker, were broken up by a sledge hammer to a convenient size to enter the jaw of the rock breaker. When the available mineral separated from the waste rock in compact lumps of sufficient size, hand-picking accompanied the work of disintegration.

In some of the American mines dealing with large tonnages, notably in the Lake Superior district where copper occurred in masses in the metallic state, drop hammers, operated upon the principle of the pile driver, were used for breaking up large masses of rock, preparatory to freeing the mass metal for smelting. These hammers had a falling weight of 2,000 lbs., and a drop of from 6 ft. to 20 ft. The use of the sledge hammer for breaking up the larger rocks was common in all mining regions, and was sometimes followed by the use of a "spalling hammer" for breaking down lumps to a uniform size by means of light swift blows. The "spalling hammer" was in its turn sometimes followed by a "cobbing hammer"; the object of cobbing being to expose the mineral for hand-picking from the less highly mineralised ore.

Before passing to the consideration of the mechanical rock-breaker, Mr. Barron referred to the practice in this country of hand breaking the rock, used in repairing roads. The question was sometimes asked why, with the wide application the breaking machine now had, did we still adhere to the slow and laborious method of hand-breaking stones by the road side? There were two reasons: First, hand-breaking, or "knapping," produced a minimum of "fines." Experiments proved that the amount of "fines," i.e., material below a certain size, resulting from the two methods was about double from the machine what it was by hand-knapping. Secondly, it was claimed for hand-breaking that the fracture followed a certain natural cleavage, which left the stone otherwise intact, and with greater strength to withstand the weight and attrition to which it was subjected in the road. On the contrary, a machine tended to shatter the rock and to start fractures where it did not actually produce a cleavage, leaving the stone less able to resist the wear to which it was subjected.

### Mechanical Crushing Plants

Coming to the first stage of mechanical crushing the Blake Crusher was the earliest machine of a "jaw" type to be introduced. It was the invention of Mr. Eli Whitney Blake, of Connecticut, U.S.A., was first used in 1858, and had been a standard type ever since, being the most generally used of all machines for the rough breaking of ores, rocks and slags, reducing them down to pieces of from 1 in. to 3 in. cube according to the size of the machine. It had undergone no change in principle, and very little in design since it was first brought out sixty years ago. Generally speaking, the present day size of the jaw-opening ranged from 10 in. x 7 in. in the smallest machine, to 54 in. x 24 in. in the largest. A drawing of this type of crusher was then exhibited, showing in section the design of the machine. The machine was first introduced for mining purposes, or ore treatment, about the year 1861. Blake was a surveyor in a small Connecticut town, and he designed the machine originally for the breaking up of stones for road making. It was soon seen, however, that it was susceptible of a wider application. The Californian gold boom occurred about the same time, and it was applied to the breaking up of ore for the stamp mill. Previous to its adoption 25 to 30 Chinamen had been employed breaking up, with hammers, 25 to 30 tons of ore per day.

About 30 years later a type of gyratory crusher or breaker was introduced, consisting of a vertical spindle with a conical head attached, which was set inside a very massive frame, circular in plan. The shaft was set into an eccentric bushing or bearing to which the gearing was attached, the effect being to give the spindle a gyratory motion varying in stroke with the size of the machine from 1½ in. to 3 in. at bottom of spindle. The ore was brought in trucks and dumped into the hopper, the material falling around the circular head. The crushing movement commenced at the top, and the material was gradually reduced in size until it reached the narrowest point between the crushing head and the "conceals," as they were called, and passed out. The crushing face of machine was lined with manganese steel in segments. The machine had great working capacity and could deal with large pieces of rock. It had an inherent advantage over the "Blake" type owing to the crushing surface being circular, making it impossible for the machine to pass laminated material through in slabs. Generally speaking, the

gyratory crusher was only used for large tonnages, and there were now something like half a dozen different makes all on the same principle, only one being made in this country at present and the remainder in U.S.A.

Mr. Barron then described a variant of the gyratory crusher with an eccentric bushing extending up the centre of the head, giving it an equal throw all the way up its length. The bottom of the bushing was keyed to a gear with a pinion, and when revolution took place there was an equal amount of motion from top to bottom. The advantage was that the centre of gravity was low, and the weight of the machine very much less. Six of these machines were used in the construction of the docks at Rosyth, and they had a certain vogue in America. One drawback was that they required forced lubrication.

Another machine of the breaker class, used for relatively fine crushing, was the "Dodge" crusher, having a jaw the moving face of which was attached to a lever worked from an eccentric shaft by means of a pitman, and the action was to oscillate the lever upon a fulcrum pin, so that the greater part of the movement was put upon the upper part of the jaw. This was a departure from accepted practice, but the type possessed certain advantages. The product was of a more uniform size and could be determined by adjustment. The machine was a very useful one, particularly for mills of small capacity.

The next class of machines considered were the "Medium" crushers, which reduced the product of the "breaker" class down to, say, ½ in. First in order of these were rolls, consisting of two rolls, the average size of which were, say, 30 in. diameter by 15 in. wide on the face, the faces revolving towards each other at a distance apart varying with the size of the material required. Crushing rolls were used chiefly in cases where the material was required to be broken down to from ½ in. to 1/16th in., though quite frequently the product was as large as ¼ in. in coarse concentration mills. The use of this machine was advantageous, inasmuch as it produced less "fines" than others. Rolls were generally used for intermediate crushing in concentration mills. The rolls varied in sizes from about 16 in. diameter by 10 in. wide on the face up to 48 in., or even 54 in. diameter by 18 in. or 20 in. on the face. The faces naturally became worn, the material dealt with being apt to groove them, involving the return of a certain amount of material to the rolls as over-size for re-crushing. This was to some extent provided against in modern machines by one roll having a lateral adjustment of about ½ in. When the faces became too worn to produce the required size, or produced too large an amount of "over-size," the shells were turned on the face and made true again. If used for fine crushing, the machine was driven at a comparatively high speed.

Mr. Barron then explained the "Symons Disc Crusher," which made use of the gyratory principle on a horizontally arranged spindle. An outer casing carrying a saucer-like disc revolved, and the gyrating spindle within the casing was also driven. This spindle carried a saucer-like disc. The two discs were opposite each other, with the hollow side inwards. An eccentric bushing at the driven end of the spindle produced a gyrating motion at the disc, and gives it an advancing and receding movement towards and from the true running disc. The material to be crushed was fed through a stationary pipe into the space between the discs, the ore being nipped between the two faces of discs, or saucer-like pieces, and was thus crushed; the adjustable distance apart of the discs determined the size of the product, and the centrifugal force throwing the crushed particles into a casing, from whence they dropped into a suitable receptacle. The machine was useful for crushing material from, say, 4 in. or 5 in. down to ½ in. or ¼ in.

The next machine described was the stamp mill, a very old form of crusher which was in use in Cornwall a century ago, although not in its present form. Its early form of construction consisted of wooden stems or spindles, with ironshod ends, crushing the ore in a sort of mortar. A modern stamp installation usually consisted of five stems or stamps, and the present type might be said to have come into existence about the year 1855 and during the gold boom in California. The falling weight of the stamps was gradually increased from about 500 lb. each until at the present time they were approximately 1,500 lb. each.

After describing the steam stamp and the pneumatic stamp, Mr. Barron said the latest successful variant of the stamp battery was the "high-duty gravity stamp." This was a single stamp with a falling weight of 2,000 lb. working in a circular mortar box with a screen practically all round. The advantage with these single high-duty stamps was larger output.

In explaining the construction and method of operation of the "Hardinge Conical Mill," Mr. Barron directed attention to the use of steel balls as a crushing medium. The ore passed from a feeder through the trunnion of the mill and mingled with the balls, the revolution of the cylinder causing the balls to cascade over the ore and crush it. The cylinder revolved at about 35 revolutions per minute. The object of the conical form of the mill was to prevent sliming, as for "concentration" purposes it was important to preserve the ore in a granular state while crushing fine; whereas in the preparation of ore for the cyanide process a state of "slime" was usual. The "Hardinge Conical Mill" had been in use for

about 15 years, and in some cases had displaced stamps. It had the advantage of being simple in construction. The wearing parts were steel linings and the balls were easily replaced. This machine would take a 1½ in. feed and reduce it to pass 900 or 1,600 meshes to the square inch. The size of the product was regulated by the rate of feeding.

The "Chilian Mill" was then described—a crusher on the edge-runner principle having three rollers attached to trunnions. The rollers ran round on a ring die in a pan, the ore being fed into the path of the rollers. The machine was good for crushing down to 40 or 50 meshes to the linear inch, or 1,600 to 2,500 to the square inch, and was a development of a very old idea. For instance, in China they still used a stone roller attached to a wooden axle pivoted and extended to which a bullock was hitched and worked the roller in a circular path. The ordinary mortar mill was a somewhat similar device. The Chilian Mill was an efficient machine and had large capacity.

The "Huntingdon Mill" was rather different in principle, as it mainly depended upon centrifugal action. It had four rollers suspended from spindles a little out of the vertical, causing the rollers to press outwards against a steel ring die, the ore being crushed between the rollers and the die. The swirling action set up by the revolution of the rollers threw the "pulp" or wet product out through the screens into a trough outside. This was also a machine which had been introduced in California in the early days of gold mining.

Coming to the last stage of fine crushing, the "Tube Mill" was described. It was a cylindrical mill 4 ft. to 6 ft. diameter and from 10 ft. to 20 ft. long, lined inside with silica blocks and using flint pebbles instead of steel balls for crushing. The ore was fed through the trunnion at one end and discharged through the trunnion at the other end. This type of mill was now being extensively used on the Rand for preparing ore, crushed by stamps, for the cyanide process. The product had to be extremely fine and was reduced to what was technically known as "slimes." The machine ran, according to size, at from 30 to 45 revolutions per minute, and the action of the flint pebbles was similar to that of the steel balls described in the "Hardinge" type. The "pulp" or "slime" was taken to the cyanide vats and treated with cyanide solution for the recovery of the gold. This mill was not used for "concentration," but only to "slime" the product.

The "Hardinge Pebble Mill," a variant of the Hardinge ball mill described above, was used for fine grinding but not for sliming, the aim being to preserve the particles in a granular form.

Owing to the lateness of the hour Mr. Barron was not able to give a number of other examples. In concluding, he emphasised the point that it was important to eliminate before each stage of crushing the size of product below that to which it was intended to crush next, in order to relieve the machines of unnecessary work. "Concentration" involved classification or sizing before treatment on the different types of concentrating machine.

## Chemistry During the War

Lecture by Professor James Walker

At a meeting of the Chemical Society at Burlington House on Thursday, December 18, Dr. James Walker, Professor of Chemistry at the University of Edinburgh, delivered a lecture on "War Experiences in the Manufacture of Nitric Acid and the Recovery of Nitrous Fumes."

Professor Walker opened with an account of the establishment of a small factory for the production of T.N.T., which was financed, managed and staffed by teachers, graduates and students of the Chemistry Department of the University of Edinburgh, known as the Lothian Chemical Company. The company operated in a disused chemical works, which were adapted to T.N.T. manufacture. Reconstruction of these works commenced in April, 1915, and the company entered into a contract to supply 150 tons of T.N.T. by the end of February, 1916; this was fulfilled before the time stated.

It was found, however, that the factory could not be largely extended, and the demand for T.N.T. becoming very urgent, the management undertook the construction and running of a Government factory in the neighbourhood of Edinburgh, known as H.M. Factory, Craigmyle. This factory was originally designed to produce 30 tons weekly, but by the end of the war the output was doubled. The original factory, being in a populous neighbourhood, was subsequently shut down, and reconstructed for the production of calcium nitrate derived from nitric acid produced by the catalytic oxidation of ammonia.

Great Britain had depended entirely upon imports from overseas for its supply of nitrate and nitric acid—sodium nitrate from South America and calcium nitrate from Norway—and as these supplies were limited and menaced by submarine warfare, the necessity for economy, and for home production, was very great. The output of by-product ammonia was extensive in this country, and its conversion into nitric acid by catalytic oxidation was undertaken,

though at so late a period of the war that the actual production at the date of the armistice was still inconsiderable. The recovery of nitric acid from the nitrous fumes produced in the nitrations of organic substances was of far greater immediate practical importance.

### Description of Plant

An account of the plant used in the production of nitric acid from sodium nitrate was illustrated by slides, and the lecturer carried out experiments demonstrating the catalytic oxidation of ammonia. The plant used by the Lothian Chemical Co. was of the type suggested by the Munitions Inventions Department. A mixture of air and ammonia containing 10-12 per cent. of ammonia was passed through a fine platinum wire gauze, kept at a temperature of 650° to 700°C. The heat produced by the reaction was sufficient to keep the temperature up to this point. (An account of a smaller apparatus of the same type is to be found in a report on the catalytic oxidation of ammonia by the Munitions Inventions Department.) Under favourable circumstances this plant yielded 97 per cent. The nitric oxide produced was converted into nitric acid in towers similar in principle to the fume recovery towers used in the manufacture of T.N.T. at Craigmyle. There were also illustrated by slides.

The denitrator used for the denitration of waste acid from the nitration process was built of acid-resisting brick, on the general principle of a rectifying apparatus or still. Denitration was effected by steam alone. There were six fume recovery towers, and it was possible to obtain a yield of 93 per cent. of the nitrogen in the waste acid charged to the denitrators in the form of nitric acid of about 60 per cent. concentration.

The following table shows the effect of this recovery:—

Ratio of HNO<sub>3</sub> Used to T.N.T. Produced.

I. C. Co. (no recovery) ... ..	1.27
Craigmyle, December, 1917 ... ..	1.19
Craigmyle, June, 1918 ... ..	1.05
Craigmyle, September, 1918 ... ..	0.955

As the recovery process became more perfect the amount of the original nitrogen of the sodium nitrate sent out in the manufactured T.N.T. became increasingly great, until, in September, 1918, the figures stood as follows:—

Ultimate Destination of Nitrogen.

Sent out in T.N.T. ... ..	81.66 p.c.
Losses { Sodium nitrate ... .. 0.98	18.34 p.c.
{ N.A. manufacture ... .. 5.42	
{ Nitration, washing, &c. ... .. 9.91	
{ Denitration ... .. 2.03	

In this connection the management were informed by the Ministry of Munitions that for the months of September and October, 1918, the nitrogen economy at H.M. Factory, Craigmyle, constituted a record for the country. This satisfactory result the lecturer attributed largely to the excellent team work of the staff, and he referred particularly to the good work of the chief chemist, Mr. Donald Grant, who was an assistant science teacher in a secondary school at Edinburgh. Mr. Grant had had no previous technical training. The moral, therefore, was that the academically trained chemist could safely venture into chemical manufacture, provided that he had common sense and energy, and was willing to work with people with practical experience and to take advice from engineering experts.

At the conclusion of the proceedings a hearty vote of thanks was accorded Professor Walker for his address.

### Crude Petroleum in U.S.A.

THE United States Geological Survey has prepared a comparative summary of the quantities of crude petroleum produced and marketed, imported, exported, and held in storage in the United States in June and July, 1919, and in July, 1918. The quantity of crude petroleum run from wells and producers' field-storage tanks and delivered to pipe lines of marketing companies, refineries and other consumers in July, 1919, was approximately 33½ million barrels (42 gallons each), an increase of 7.3 per cent. compared with June, 1919, and of 10.4 per cent. compared with July, 1918. This increase is attributed largely to improved conditions in the market for drilling equipment, to continued high prices for oil and to the stimulation given to the search for petroleum during the war. It is estimated that 98 per cent. of this oil was actually brought to the surface in the United States during the months specified, the remaining 2 per cent. consisting of runs or tank-car shipments from field storage. Since the termination of the war there has been a good increase in the surface reserve of domestic petroleum. The United States leads other countries in the production of crude petroleum, but the quantity obtained from domestic sources is inadequate to meet the demand, and a large volume is imported, chiefly from Mexico. Although the petroleum exports of the United States consist chiefly of refined products, a substantial volume of crude oil is exported for the manufacture of petroleum products in Canada, Cuba and other countries.



## Storage Batteries

Lecture by Mr. C. E. Ollard before the R.C.S.  
Chemical Society

IN a lecture on "Storage Batteries," given before the Chemical Society of the Royal College of Science on Friday, December 12, Mr. E. A. Ollard, reviewing his war-time experiences in the Royal Navy, produced an able treatment of the practical aspect of the use of accumulator sets.

After indicating the development of the original lead-plate accumulator of Planté into the paste-plate (Faure) type, now almost exclusively used, Mr. Ollard discussed the construction of the latter type and its constituent parts. It was pointed out that the negative plates, lead grids, which when changed hold a deposit of spongy lead, are always greater in number by one than the positive plates, similar grids with a deposit of lead peroxide; and that the series of plates are kept from contact by sheets of perforated celluloid or specially prepared wood pulp; and that indirect contact through the accumulated lead and lead oxide, which gradually wears off the surface of the plate and falls to the floor of the cell, is prevented either by ridging the floor or providing supports from which the plates are hung. Corrosion of the brass terminals by acid mounting from the cell is prevented in the case of portable accumulators by the provision of grease cups beneath the screw discs, and it is important, particularly with the positive terminals, that these grease cups should be kept full of grease.

The reaction which proceeds with the discharge of the cell involves the progressive disappearance of the sulphuric acid electrolyte, and the resulting dilution of the acid affords the best criterion of the state of the cell. The voltage shown by a cell will remain constant for a wide range of capacity, but a graph plotted between the density of the acid and the capacity of the cell in ampere-hours indicates a linear relationship. An abnormally low value for the density of a strange set of accumulators may occasionally be found to persist after recharging, in which case it will be suspected that the acid has been diluted, a course which may be resorted to in emergency without damage to the cell.

### Chemical Basis of Reactions

The chemical basis of the reactions occurring in an accumulator was then explained in detail and particular reference was made to certain points which are apt to prove somewhat puzzling at first sight, namely, the retention of the plates in their original form after repeated cycles of chemical reaction. The explanation, Mr. Ollard said, was to be found (1) in the very slight solubility of all the constituents of the cell; and (2) in the apparent indifference of the lead grid and peroxide packing of the one plate, which arises in the formation of a protecting layer of sulphate in the spontaneous discharge which does actually occur at first. In consequence of the latter action it is advisable that the internal parts should be smooth so as to minimise this secondary action.

While increasing the concentration of the acid gives a corresponding increase in the E.M.F. obtained, local action prevents in general the use of an acid solution of density exceeding 1.2. The capacity of the cell, on the other hand, depends largely on the manner in which the discharge is allowed to take place. The theoretical maximum can never be obtained and the number of ampere-hours given for a selected rate of discharge may be obtained from the formula  $I^2t = K$ , where  $I$  is the initial voltage,  $t$  is constant (generally 1.4) for the particular cell plates,  $t$  is the time in which the discharge is completed,  $K$  a constant value.

With regard to the process of charging, it is as a general rule advisable to use the charging rate, which may be specified on the accumulator, particularly in the case of paste plates, in which a rate of charging suitable for a Planté cell would buckle the grids. It is invariably advisable to avoid any heating during the process of charging. For 12 hours the cell is charged at the rate specified, and by the end of that time full evolution of gas by reason of the electrolysis of the water should be noticed; at this stage the charging current is reduced to one-half, and allowed to run for a further 12 hours. If an "overcharge" is required, either periodically or in preparation for storage, the charging should be continued for a further 24 hours at a mere fraction of the normal rate, and it may then be assumed that the maximum capacity is attained. In discharging, the specified maximum rate must on no account be exceeded, since the formation of persulphates or even entire buckling must necessarily accompany a rapid discharge.

If an accumulator is allowed to remain filled and uncharged for a prolonged period, a hard scale of lead sulphate is formed over the plates and gives to the rise conditions of sulphation. Sulphating in mild degree may be remedied by constantly charging and discharging, but it is otherwise necessary to remove the scale by scraping. Local action, another abnormal process that may occur, owes its origin to the presence of impurities in the plate or in the electrolyte, and in the latter case only is it capable of rectification. A further trouble that may be experienced at sea is the entry of sea water into the accumulator which, liberating chlorine by electrolysis, spoils the lead plates and may vitiate the atmosphere in a confined space.

### Various Tests

Various tests are applicable in order to ascertain the condition of a cell. First, the density should be tested, and the colour of the plates observed; in the charged cell the positive plate is a rich brown, and the negative a light grey. Further evidence as to the internal condition of a series of 80 or so accumulators may be obtained by means of the internal resistance of the individual members, when the series is subjected to a charging current of 3-4 amperes. Any such cell which shows an excessive P.D. when tested by voltmeter must be suspected of an abnormal condition. Further, any cell which fails to "fizz" in unison with the majority must be reserved for prolonged charging. Reversed polarity may be caused when by accident one member of an accumulator set has been wrongly connected, and its remedy lies in discharging completely, recharging in the reverse direction and alternating.

Questions were put and answered, and the meeting concluded with a hearty vote of thanks to the lecturer.

## Reconstruction of Ammonia Plant

Paper by a Works Chemist

DETAILS of the reconstruction of a sulphate of ammonia plant were given in a Paper read before the Midland Junior Gas Association by Mr. Joseph Poulson, works chemist, Stafford, on Thursday, December 18, at the Council House, Birmingham. Mr. Carrington Barber presided.

The author pointed out that in the old plant the stills had fractured through settlement, causing the main still to be out of the vertical by 5 in. The mother liquor well had also suffered from the settlement of the ground, with the result that the strain caused fractures of the lead lining of the well, with consequent loss of mother liquor and the damage to the foundations that made itself apparent, called for immediate remedial measures. The silica and alumina sludge that settled in the bottom of the lining vessel was emptied by means of a conical plug valve and lever into a shallow well directly under that vessel, and had to be ladled out of same.

In the erection of the stills the jointing material used consisted of 2 parts glazier's putty, 1 part Vulcan cement, 1 part red lead, mixed with boiled linseed oil, and in this a soft cotton string was embedded. The lining still consists of cylindrical body, shallow domed top, conical bottom, and inlet and outlet pipes. A 6 in. sludge outlet pipe and valve were fitted to the conical bottom and the pipe led into the spent liquor pits at the back of the house. The new heater is 3 ft. diameter by 8 ft. high, and is of cast iron throughout. It consists of flanged cylindrical body, and fitted with flanged cap-shaped ends. The waste gases pass around 5 in. heavy cast-iron pipes, each end being jointed in sockets cast on a diaphragm plate, which is bolted between the end and body of the heater. The liquor is heated on its passage through the inside of the pipes.

The sulphate store was lead lined, namely, bottom and sides, the latter to a height of 10 ft., all joints being well lead burned as laid.

The saturator is of the open type, having a well for ejecting, the size being 4 ft. 9 in. by 3 ft. 6 in. by 3 ft. 4 in. deep, exclusive of well. The body is formed from plates 1½ in. thick, with an apron of 1½ in., and the bottom and well of 1½ in. lead. It is made of refined Pattisonian process chemical plate lead, with a minimum of seams, special attention being given to the strengthening and webbing where needed, to ensure its keeping shape, and all is securely timber braced. The well is encased in a strongly bolted pitch pine cradle, the saturator sitting solidly on same. The saturator is fitted with double detachable ammonia pipes, detachable acid and steam pipes, detachable steam ejector, manhole and man-lid, waste gas outlet and flange. With this type of saturator, not only can the salt be ejected, but being of the open type, can be adapted to hand fishing should the ejector need repairs or renewal. The double ammonia pipes are advantageous both for long life, and being carried along the back and two sides, give that equalised distribution of the ammonia gases so desired. The perforated (lead) steam pipe has proved useful for dissolving the crystals that form round the ammonia pipes, and saturator sides after the plant has been shut down. Also, by putting the steam on at intervals for half a minute when the saturator is salting, a better contact is given to the ammonia gases with the acid, and the salt is blown to the front of the saturator into the well. A steam ejector lifts the mother liquor from the mother liquor well into the saturator.

Improvements are to be observed in the working of the plant. The increased efficiency of the heater and main still has resulted in a decided economy of steam, as waste liquor is obtained practically free from ammonia with a pressure of 10 lb. on the steam branch of the stills, whereas they are previously worked at 10 lb. to 18 lb. A substantial increase of mother liquor has given a corresponding increase of sulphate made, and the larger sized saturator has proved beneficial for increase and quality of the sulphate made. The dryer runs free from vibration, and gets its maximum speed of about 900 revs. per min. in 30 to 40 seconds from starting, and after a four-minute run gives a moisture content in the sulphate of under 2 per cent.

A process for making neutral dry sulphate is being proceeded with.

## References to Current Literature

### British

- CHLORINE.** The interaction of chlorine and hydrogen. D. L. Chapman and J. R. H. Wilson. *Chem. Soc. Trans.*, December, 1264-1269. The influence of pressure on the interaction of the gases has been studied.
- COMBUSTION.** Determination of ignition temperatures by the soap-bubble method. A. G. White and T. W. Price. *Chem. Soc. Trans.*, December, 1248-1264. The conditions under which this method gives consistent results have been established.
- FUEL.** The application of liquid fuel to heavy-oil engines. A. J. Wilson. *Gas World*, December 20, 498-500. Report of a paper read before the Institution of Petroleum Technologists, December 16.
- IRON.** Future developments in puddled iron manufacture. J. E. Fletcher. *Engineering*, December 19, 836-840. Conclusion of paper already noted. (CHEMICAL AGE, p. 725.)
- Electrolytic deposition of iron. W. A. Macfadyen. *Engineering*, December 19, 827-828. An account of a paper read before the Faraday Society on December 15.
- PERCHLORATES.** Electrolytic formation of perchlorate from chlorate. J. G. Williams. *Engineering*, December 19, 828; also *Chem. Trade J.*, December 20, 703-704. A paper read before the Faraday Society on December 15.
- POWER.** Sources of power known and unknown. O. Lodge. *J. Roy. Soc. Arts*, December 19, 66-74. An interesting lecture given to the Society on December 10.
- STEEL.** Valve failures and valve steels in internal combustion engines. L. Aitchison. *Engineering*, December 12 and 19, 799-802, 834-836. A useful paper read before the Institution of Automobile Engineers on November 5.

### Colonial

- PLANT.** The economic and natural factors affecting factory location in South Africa. S. E. T. Ewing. *S. Afr. J. Ind.*, October, 923-950. A valuable paper containing many data on cost of land, taxation, costs of power, labour, freights, &c., in various parts of South Africa.

### French

- CALCIUM PHOSPHATES.** New physico-chemical method for analysing precipitates. Application to the study of the phosphates of calcium. P. Jolibois. *Comptes Rend.*, December 15, 1161-1163. The mixing apparatus already noted (CHEMICAL AGE, p. 725) has been used for the study of the precipitates formed on mixing lime water and phosphoric acid.
- CLAYS.** The relation between chemical composition, microscopic structure, and ceramic qualities of clays. L. Bertrand and A. Lanquine. *Comptes Rend.*, December 15, 1171-1174.

## Government Chemists

### Report for the Past Year

THE report of the Government chemist upon the work of the Government Laboratory for the year ended March 31 last states that the total number of samples examined, including those dealt with at the outpost chemical stations, was 289,180, an increase of 20,062 on the previous year. The report is largely occupied with fine drugs, and details are given of the results.

During the year, 14,941 samples of medicinal spirits, tinctures, perfumes, hair-washes, dentrifices, liniments, extracts, infusions, &c., were examined as to their character and spirit strength in order to check the exporters' claim for drawback on the spirit used in their manufacture; and, in addition, 3,628 liniments, hair-washes and other preparations were tested for the presence of methylated spirit, the use of which in such preparations is prohibited. In three of these the presence of methyl alcohol was detected, and in 373 cases the declared spirit strength of the preparations was overstated. The export of these preparations had been greatly interfered with by restrictions due to the war, the decrease in the exportation of perfumes and essences being proportionally greater than in the case of medicinal tinctures and lotions, of which considerable quantities were sent out for the use of the troops.

Samples of wood naphtha and of mineral naphtha, intended for use in the preparation of methylated spirit, to the number of 765 were examined. The naphtha represented by 743 of these samples was approved as fit for methylating purposes, whilst that represented by the other 22 samples was found to be unsuitable. The number of samples examined again shows a decrease as compared with those of last year, which numbered 877. The decrease is largely due to the current high prices and the consequent falling off in the quantity of

"mineralised methylated spirit" used for heating and other purposes. In connection with the use of pure and specially denatured alcohol in manufacturing operations, 192 samples of petroleum, other and other denaturing substances have been examined, as well as 22 samples of pure alcohol and 36 samples of specially denatured alcohol. With the object of preventing the illegal use of methylated spirit in making tinctures, essences, perfumes and medicinal preparations, 25 samples taken from manufacturers and retailers were examined, in addition to those taken under the Export Tincture Regulations. For the purpose of controlling the use of duty-free methylated and other denatured spirit in connection with manufacturing operations, 515 samples of recovered spirit, residues from stills, articles manufactured with industrial spirit, and preparations containing such spirit were examined.

The miscellaneous samples received in connection with the Tobacco Duty numbered 1,284. There were 327 samples of nicotine solutions for horticultural purposes, hop powders, sheep dip powders, and substances to be used in denaturing offal tobacco. Thirty-four were samples of oil, all of which were suitable for use in manufacturing roll tobacco.

The samples of sugar examined on importation, as well as those exported on drawback, include, besides sugar, articles made with sugar, and also those containing glucose, molasses, saccharin and other sweetening agents. Glucose is largely used for brewing purposes and in confectionery; molasses enters into the composition of food for cattle, blacking, sauces and dyewood extracts, and is employed in the manufacture of spirit; saccharin is an intensely sweet coal-tar product which is frequently substituted for sugar in the manufacture of mineral waters and in the preparation of foods intended for diabetic patients. In consequence of the limited quantity of sugar available during the war, saccharin was increasingly used by the general public for sweetening purposes. Glucose manufactured in this country is subject to an Excise duty. In connection with the assessment of this duty, 266 samples of glucose solution taken from the charging vessels during the course of manufacture were examined in order to check the manufacturers' declarations, and 42 for assessment of drawback on exportation, together with 73 of glucose used in syrups made at sugar refineries. Owing to the heavy duty on saccharin, which has approximately 500 times the sweetening power of sugar, the inducement to smuggle this article into the country is very great. The presence of saccharin has, therefore, to be searched for in all preparations in which there is any probability of its occurrence, and 55 samples of substances imported were specially examined with this object. Ten samples of saccharin products were drawn for the purpose of assessing the amount of drawback payable on exportation. The manufacture of saccharin in the United Kingdom, which had ceased for some years, was resumed in 1917, and 165 samples of saccharin and of the materials used in its production were examined in connection with the assessment of duty.

Rejected tea is allowed delivery duty free for use in the manufacture of caffeine or theine, the alkaloid which imparts to coffee and tea their stimulating properties, and which is extracted for use as a drug. In such cases, the tea has first to be denatured under the supervision of Customs and Excise officers, to prevent its possible use for human consumption, and samples, both of the denatured tea and the denaturants used, are submitted to the laboratory for test to ensure that the process has been effectively carried out. The number of such samples examined during the year was 464.

During the year 4,116 samples, mainly alloys used in air-craft construction, were examined for this department, and a number of investigations into questions of corrosion were carried out.

Twenty-six samples of sheep dips were received for examination in connection with applications by manufacturers for inclusion of their preparations in the official "Schedule of efficient dips." Before the Board of Agriculture give their approval to any dip they must be satisfied that the formula provides for a sufficient quantity of a recognised active ingredient and that the dip has been made in accordance with the formula. In 15 cases the samples were found to agree with the formulæ, and were of effective strength at the proposed dilution; six were deficient in active ingredients at the dilution submitted by the makers; in the remaining five cases the formulæ required modification to ensure an efficient dip. Four samples of approved dips obtained in different parts of the country were also examined with the object of ascertaining whether the dips as sold or used correspond in composition with the samples which had received the Board's approval. The analyses showed that one of these had not been prepared according to the formulæ previously submitted and approved. The miscellaneous samples examined by the Board of Agriculture and Fisheries included samples for the Food Production Department, waste materials, as to their value as fertilisers; cattle-feeding stuffs; basic slag; potash materials; seeds; insecticides and manures.

In the course of the year numerous matters have been submitted by the Board for report. Many of these related to the value of materials supplied as feeding-stuffs, and to the supply of potash and phosphatic manures. The official method for the determination of potash in fertilisers has been revised and a new method drawn up for use in the case of flue dust (F. & F. Stuffs (methods of analysis) Regulations No. 659, 1918).

## Patent Literature

We publish each week a list of selected complete specifications accepted as and when they are actually printed and on sale. In addition, we give abstracts within a week of the specifications being obtainable. Readers can thus decide what specifications are of sufficient interest to warrant purchase, the only way of obtaining complete information. A list of International Convention specifications open to inspection before acceptance is added, and abstracts are given as soon as possible.

### Abstracts of Complete Specifications

- 117,615. PETROLS, PETROLEUMS, BENZOLS AND THE LIKE. PROCESS AND APPARATUS FOR THE CONTINUOUS FRACTIONAL DISTILLATION OF. E. Barbet et Fils et Cie, 5, Rue de l'Echelle, Paris. International Convention date (France), July 3, 1917. Addition to 9,088/1914, April 12, 1913.

Crude petroleum is passed through a dehydrating column heated by exhaust steam, and the water and petrol vapour passed to a cooler and separator. The dehydrated petroleum passes to a plate column, where petrol is distilled off and passes to a cooler. The oil vapour passes to a reflux condenser and the petroleum to the bottom of another plate column which is maintained under vacuum. Part of the petroleum is vapourised by the reduced pressure, and the vapour is fractionated in a reflux condenser. The condensed spirit passes to a tank, and the uncondensed vapour to a vacuum vessel. The liquid from the second plate column is passed to another vessel for further fractionation, the vapour being returned to the plate column.

- 120,558. TAR FROM TAR-CONTAINING LIQUIDS, PROCESS FOR REMOVING. E. Barbet et Fils et Cie, 5, Rue de l'Echelle, Paris. International Convention date (France) October 11, 1917.

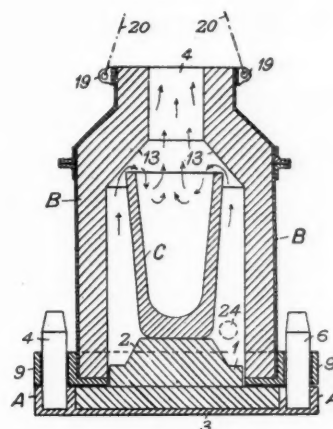
Liquid containing tar, such as the solution of acetates obtained by the distillation of wood, is fed into the top of a cylinder containing balls of porcelain, quartz or powdered glass, coke, &c., and cresol is similarly fed into the bottom of the cylinder. The two liquids are intimately mixed, and the tar is extracted by the cresol, which forms a layer at the top, and may thus be withdrawn. The tar-free solution of acetates collects at the bottom, and is withdrawn. Aromatic hydrocarbons, or esters such as methyl acetate may be employed in place of cresol.

- 135,224. AMMONIA, OXIDATION OF. H. E. F. Goold-Adams, 10, Prince's Street, Westminster, London, S.W.1.; J. R. Partington, School Lane, Lostock Gralam, Cheshire; and E. K. Rideal, 28, Victoria Street, London, S.W.1. Application date, July 7, 1917.

Ammonia is oxidised with the aid of a catalyst consisting of nickel in the form of gauze, network, or perforated plate. The nickel gauze may be first heated in a current of air to produce surface oxidation, or, alternatively, oxides of nickel, chromium, lead, bismuth, or other catalytic material may be deposited on the surface of the gauze, or added to the oxidised gauze.

- 135,241. CRUCIBLE FURNACES. W. A. Shilton, Alvaston, Little Heath Road, Coventry; and R. A. Munden, 54, Styvechale Avenue, Coventry. Application date October 17, 1918.

A gas-heated crucible furnace comprises a base part, A, on which the crucible stands, and a removable cover, B, which encloses the crucible C. The fire-brick slab, 1, is provided with a platform, 2, and is supported on a plate, 3, which carries upright guide pins, 4, 6. The cover, B, comprises a sheet-metal casing with a refractory lining, attached to a base ring, 9, which is constructed with perforated lugs adapted to fit over the guides, 6. Heating burners are inserted through openings, 24 and the hot gases are deflected by the shoulders, 13, on to the material in the crucible, C. The cover may be lifted and lowered by chains, 20, attached to the lugs, 19. In an alternative construction, the cover may be guided during the whole of its vertical travel.



135,241

- 135,246. POTASSIUM CHLORIDE, PROCESS FOR THE MANUFACTURE AND PRODUCTION OF. E. E. Dutt and P. C. Dutt, Jubbulpore, India. Application date, October 18, 1918.

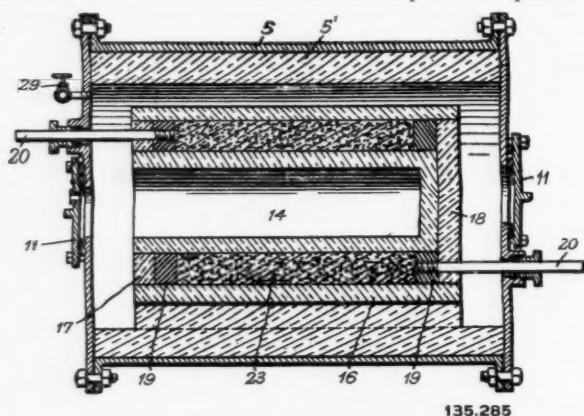
The process is for treating silicate rocks, such as feldspar, to produce potassium fluoride and subsequently potassium chloride. Two rotary furnace chambers are arranged end to end, one being charged with a mixture of potassium fluoride, sand, and coke or coal, and the other with small pieces of feldspar. Both chambers are heated to bright redness and hydrochloric acid gas is passed through. In the first chamber, potassium chloride, silicon tetrafluoride, carbon monoxide, and hydrogen are formed. The gases pass into the other chamber, where the silicon tetrafluoride reacts with the feldspar, producing potassium fluoride as described in 133,474 (see THE CHEMICAL AGE, of November 15). The mass in the first chamber is lixiviated with water, and the resulting potassium chloride solution is separated and crystallised. The mass in the second chamber is similarly lixiviated to separate the potassium fluoride, which may then be used for the reaction in the first chamber.

- 135,285. BARIUM OXIDE, PROCESS OF PRODUCING. J. B. Pierce, jun., Box 932, Charleston, W. Va., U.S.A. Application date, November 19, 1918.

The process is for producing barium oxide capable of oxidation into barium peroxide of over 88 per cent., from barium carbonate. The apparatus consists of a casing, 5, lined with refractory material, 5<sup>1</sup>, and having openings at the end which may be closed by covers, 11. An inner refractory cylinder, 16, closed at one end by a plate, 18, encloses the refractory reaction chamber, 14. The annular space is closed by a refractory ring, 17, and is packed with granular carbon, 23, to which an electric current is conducted through graphite electrodes, 20, and graphite rings, 19. The reaction chamber, 14, is first heated to about 1,000°C., then charged with pure or commercial barium carbonate, and again heated to 1,000°C. The casing, 5, is then evacuated to 25-26 in. of mercury through the valve, 29, for 5 to 10 minutes to extract all moisture. Carbon dioxide or a mixture of carbon dioxide, nitrogen, and oxygen, is then supplied to the casing, 5, at a pressure of 10 lb. per square inch to prevent decomposition of any strontium carbonate present, and the temperature is then increased to 1,250°-1,300°C. The furnace is then evacuated rapidly to 1-2 in. of mercury, when decomposition of the barium carbonate to oxide takes place. Barium oxide is thus obtained free from admixture of carbon particles, or semi-fused compounds of



oxide and carbonate, and also free from compounds of strontium oxide and barium carbonate, and is in such physical condition that efficient oxidation to barium peroxide is possible.



135,285

- 135,305. PYROLUSITE, METHOD OF TREATING. C. V. Jørgensen, 7, Haraldsgade, Copenhagen. Application date, November 22, 1918.

The object is to increase the efficiency of natural pyrolusite as a depolarising agent in galvanic cells. Pyrolusite is pulverised, mixed with a small quantity of alkali hydroxide or carbonate and heated to a red heat. Under these conditions no liberation of oxygen occurs, and the mixture is then washed with acid to free it from alkali. The product is then found to possess an increased depolarising effect.

- 135,319. GAS PRODUCER. D. J. Smith, 40, Woodberry Grove, Finsbury Park, London, N.4. Application date, Nov. 28, 1918.

The gas producer is surrounded by an annular jacket forming a steam boiler. The steam is conveyed to an engine which supplies power for effecting several operations necessary to the producer, such as rocking the firebars of the furnace, feeding the fuel, discharging ash, and operating the pump for the water supply. The exhaust steam from the engine is then conveyed to an injector by which the air supply is delivered together with the exhaust steam to the closed ashpan.

- 135,322. GRINDING, CRUSHING AND PULVERISING MILLS. J. F. Wake, 123, Victoria Road, Darlington. Application date, November 29, 1918.

The outer casing is a flat cylinder mounted on a coaxial horizontal shaft. The casing contains one or more loose rings encircling the shaft, each ring being slightly less in diameter than the next one. The rings may be parallel or tapered from  $3^\circ$  to  $6^\circ$ , and move with a rolling motion during the rotation of the casing. The material to be ground is fed by a conveyor into one side of the casing, and the ground material is delivered through a grating at the other side.

- 135,339. GAS PRODUCER. H. N. Iversen, Gandrup, Jutland, Denmark. Application date, December 11, 1918.

The apparatus is for cleaning the gas which is produced in a gas producer using peat, lignite, wood, or similar fuel. The producer is connected through a pump to a gas washer provided with means for removing tar, &c., the gas then passing to a reservoir. The outlet end of the washer is also connected by a by-pass pipe direct to the producer, or to the pump. The pump is of larger capacity than is necessary to meet the demand upon the reservoir, and is kept constantly working, so that there is a continuous circulation of gas through the washer and back to the pump or producer. The gas is therefore repeatedly passed through the washer and is efficiently cleaned.

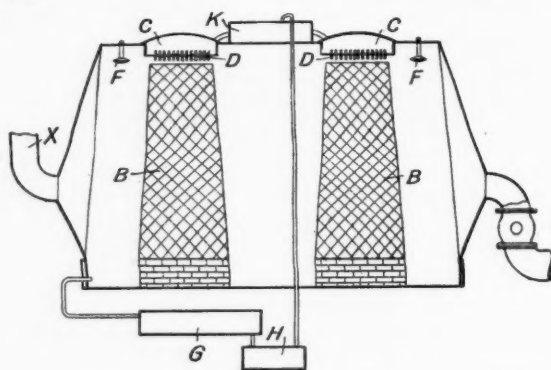
- 135,348. DAMP PEAT AS TAKEN FROM THE BOG, PREPARATION OF—FOR THE MANUFACTURE OF PRODUCER GAS. S. C. Davidson, Sirocco Engineering Works, Belfast. Application date, December 23, 1918.

The damp peat is treated in a mixing machine until rendered homogeneous, and then about 8 to 10 per cent. of slaked lime is added, and the mixing continued. The proportion of lime

added is variable, but should be sufficient to render the mixture alkaline. The gelatinous, resinous, and oily constituents of the peat are thus coagulated, and the water may then be removed as a nearly colourless liquid in a centrifugal machine, or by direct pressure. The slaked lime used should be calcium hydrate, not calcium carbonate. The product is suitable for use in a gas producer.

- 135,359. SULPHURIC ACID, MANUFACTURE OF. H. Royal-Dawson, 155, Bradford Road, Huddersfield. Application date, January 4, 1919.

The object is to obtain a more intensive working in the chamber process for the manufacture of sulphuric acid. The gases from the Glover tower enter the chamber at X, and impinge on a barrier, B, which extends right across the chamber, and is composed of acid-resisting brickwork or similar material. The acid which collects at the bottom of the chamber passes to the tank, G, and thence to the elevator, H, from which it is raised to the reservoir, K. The acid then passes to the two receptacles, C, which are joined by channels and provided with short pipes, D, which are luted by caps placed over them. The acid is distributed by the pipes, D, over the barriers, B, which are thus kept moist. Steam jets, F, may also be provided.



135,359

- 135,447. CRUCIBLE AND LIKE FURNACES. J. H. Ritson, 20, Bankwell Lane, Gateshead-on-Tyne. Application date, July 10, 1919.

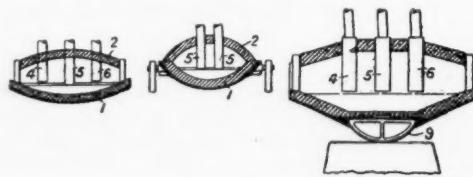
The brickwork fire chamber is supported on a metal baseplate, the outer portion of which rests on a supporting wall. The inner edge of the baseplate which is flush with the inner face of the fire chamber, carries depending brackets and perforated side plates which support the firebars at the bottom. The crucible is packed in solid fuel in the fire chamber, and air for combustion is admitted through the perforated side plates as well as between the firebars, thus minimising scarring or slagging.

Note.—Complete specification 132,771, P. Piccard (evaporating solutions) which is now accepted and published, was abstracted when it originally became open to public inspection under the International Convention (see THE CHEMICAL AGE of November 22).

#### International Specifications Not Yet Accepted

- 133,954. ELECTRIC FURNACES. M. R. Trembour, 108, Pinewoods Avenue, Troy, New York. International Convention date, March 24, 1916.

The furnace is of elliptical or similar shape in plan, and the floor, 1, and roof, 2, are curved in cross section as shown, doors



133954

being provided at the two narrow ends of the furnace. A row of electrodes, 4, 5, 6, are arranged along the major axis projecting downwards, or two rows may be arranged near the axis,

The middle electrodes are in contact with the charge and the outer electrodes slightly above, so as to form electric arcs. The furnace may be supported on trunnions or rockers, 9.

- 133,962. PURIFYING HYDROCARBON OILS. Allgemeine Ges. fur Chemische Industrie, 35, Unter den Linden, Berlin. International Convention date, April 27, 1915.

Hydrocarbons such as mineral oils and distillates, lubricating oils, shale oils, paraffin oils, &c., are sprayed into the bottom of a mixing chamber through perforated pipes, and liquid sulphur dioxide is similarly sprayed into the top. The hydrocarbon rises to the top, and is withdrawn and passed through evaporators to eliminate the sulphur dioxide which is then condensed. The sulphur dioxide collects at the bottom and is withdrawn and passed through a series of evaporators, the gaseous sulphur dioxide being passed through a condenser and cooler, and returned to the mixing chamber.

- 133,969. GAS PRODUCERS. Faconisen-Walzwerk I. Mannstaedt et Cie., Akt.-Ges., and H. Bansen, 20, Siegestrasse, Troisdorf, near Cologne. International Convention date, July 25, 1916.

The escape of gas from the poking-holes of a gas producer is prevented by a steam jet which is constructed so that it is portable, and may be fitted to any one of the poking-holes.

- 133,971. PURIFYING LIQUIDS AND GASES. P. H. A. Gaillet, Cysoing, Nord, France. International Convention date, October 18, 1918.

The apparatus is for separating impurities from liquids and gases, e.g., in purifying water, eliminating oil or water from steam, or dust from furnace gases. Elements are constructed by bending sheet metal in a special manner, so that when they are arranged in parallel rows in a chamber they form a diaphragm having pyramidal surfaces. The filtering chamber is packed with such diaphragms.

- 133,972. PYROXYLIN. E. I. Du Pont de Nemours & Co., Wilmington, Del., U.S.A. (Assignees of E. M. Flaherty, Parlin, N.J., U.S.A.), International Convention date, March 16, 1918.

Ethyl acetate and acetone may be used as solvents for the manufacture of lacquers, photographic films, artificial leather, &c., and butyl alcohol is added to prevent precipitation of the pyroxilin. Benzine may be added as a diluent. A lacquer composition may consist of nitrocellulose, butyl alcohol, ethyl acetate and benzine, while for a photographic film, nitrocellulose, butyl alcohol, methyl alcohol, amyl or butyl acetate and camphor may be used.

#### Specifications Accepted, with Date of Application

- 107,975. Alcohols, Process and Apparatus for the Continuous Rectification of. E. Barbet et Fils et Cie. October 19, 1914.  
 114,845. Hydrocarbons, Apparatus for the Continuous and Uniform Treatment of—with Sulphurous Acid. Allgemeine Ges. fur Chemische Industrie. March 21, 1917.  
 122,405. Carbohydrates, Method of Treatment of Residues containing. J. Effront and A. Boidin. January 17, 1918.  
 135,535. Nitric Acid, Process of Concentrating—and Apparatus for Use in connection therewith. E. C. R. Marks. (E. I. Du Pont de Nemours & Co.). September 6, 1918.  
 135,544. Concrete Aggregates and Materials of a similar Nature, Apparatus for Mixing together various Materials for the Dry Mixing of. T. Lea. April 16, 1919.  
 135,545. Potassium Sulphate, Process for the Manufacture and Production of. E. E. Dutt and P. C. Dutt. October 18, 1918.  
 135,577. Coal, Water, or Other Gases, Treatment of—and the Removal of Substances contained therein. A. J. Pennington and M. C. Lamb. November 25, 1918.  
 135,578. Cellulose-containing Materials, Treatment of. N. Testrup and Wetcarbonizing, Ltd. November 25, 1918.  
 135,614. Lactose or Milk Sugar, Manufacture of. G. Martin. November 28, 1918.  
 135,620. Crucible Furnaces. W. A. Shilton and R. A. Munden. October 17, 1918.  
 135,639. Electric Metallurgical Furnaces. W. E. Moore. December 7, 1918.  
 135,643. Gas Producers. D. J. Smith. December 9, 1918.  
 135,674. Electric Furnaces. E. Waring and W. Waring. December 31, 1918.  
 135,713. Potassium in the Form of Nitrate, Process for the Recovery of—from the Waste Gases of Cement Kilns and the like. H. Fairbrother. (Chemical Construction Co.). February 20, 1919.  
 135,720. Potassium Compounds, Process of Recovering. H. Fairbrother. (Chemical Construction Co.). February 24, 1919.

## Chemical Matters in Parliament

### Industrial Alcohol Report

Mr. A. J. Balfour, in reply to Mr. R. McNeill (House of Commons, December 17), stated that the recommendations of the Report of the Interdepartmental Committee on Industrial Alcohol had been under consideration by the Department of Scientific and Industrial Research, and preliminary steps were being taken in consultation with the Director of Fuel Research, to enable the Department to deal with the alcohol question in an effective manner.

### Importation of Cement

In reply to Mr. J. Davison (House of Commons, December 18), who asked why it was impossible to obtain supplies of cement from Germany and Denmark, Mr. Bridgman said that he understood that prohibitions on the export of cement were in force both in Germany and in Denmark. According to his information, however, there are ample supplies of cement available in this country, and there should be no necessity to import it.

### Effect of Pyrogallol Acid Decision

In reply to questions by Sir Donald Maclean (House of Commons, December 18), Sir A. Geddes (President of the Board of Trade) referred to Mr. Justice Sankey's decision in the pyrogallol acid case, declaring the restriction of imports under the Act of 1806 to be illegal, and stated that the restrictions on importation still remaining in force after September 1 last (when the greater number were removed) are apparently all affected by the judgment, except (1) fire-arms and military arms and parts thereof, ammunition and explosives, and (2) the articles specifically prohibited under Section 42 of the Customs Consolidation Act, 1870, or other enactments. In view of the judgment, the Customs have been instructed, pending either reversal on appeal or legislative action, to allow the importation of all articles affected thereby. An appeal against the decision is being entered. Early in the new session the Government will press forward legislation to secure powers to re-impose restrictions of the limited scope indicated in the Imports and Exports Regulation Bill. Meanwhile importers should clearly understand that, in the event of these powers being conferred by Parliament, or in the event of the judgment being reversed on appeal, licences to import restricted goods will not be granted merely on the ground that the goods had been ordered between now and the date of the re-establishment of the restrictions, but will be based solely on consideration of the reasonable requirements of the country. I also wish to say to the House that in face of the judgment his Majesty's Government will not be in a position to restrict importation from countries affected by a collapse in exchange unless or until definite enabling legislation for the purpose is enacted by Parliament.

Mr. Lambert: May I ask who is to be the judge of the reasonable requirements of the country?

Sir A. Geddes: Parliament, clearly.

Sir A. Geddes added that the restrictions in question were made purely in the interests of the country, for the protection of certain industries. One of these industries was the chemical industry which produced aniline dyes, and another was the coal industry.

### Dr. Arnold's New Steel

RESPECTING the recent reports of the discovery of a new steel made during the war by Dr. J. C. Arnold, formerly Professor of Metallurgy in the University of Sheffield, it is clear that the discovery is not a new one, but was described in a Paper read by Dr. Arnold early this year. The only new point is the withdrawal by the Government of the objection they appear to have formerly had. In the new steel 6 per cent. of molybdenum is substituted for 18 per cent. of tungsten. Dr. Arnold's discovery followed up his previous invention of vanadium steel—the best high-speed steel, which contains roughly 6 per cent. of carbon, 18 per cent. of tungsten, and, say, 3½ per cent. of chromium. The result of the substitution of molybdenum for tungsten was that he produced exactly the same steel with one-third of the amount of the most expensive element, and got equal if not better results—say a 10 per cent. better result. The importance of this from the point of view of the cost of the steel is manifest.

### Natural and Artificial Indigo

At a meeting of the Bradford Junior Branch of the Society of Dyers and Colourists, held in Bradford recently, lectures on natural indigo and artificial indigo were given by two members of the society, Mr. R. Riley and Mr. R. E. Cullingford.

Mr. Riley, after tracing the history of natural indigo described the work that had been done in order to make it able to compete with the artificial product. Mr. Riley mentioned many improvements in both the steeping and heating processes that had produced better yields. The chemistry of the various processes was fully explained, and the lecture was illustrated with lantern slides.

Mr. R. E. Cullingford, after giving a short resumé of the history of the synthesis of indigo, outlined the modern manufacturing processes, and concluded by a reference to indigo derivatives.

# Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co. and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.

## British Market Report

TUESDAY, 23rd December, 1919.

Owing to the holidays we are making up the market report two days earlier than usual.

There is very little change to report, and prices remain extremely firm. In the ordinary way it would be expected that trade would have slackened off considerably before this, but it is a striking feature of the trade at the moment that it has held active almost to the holidays.

The export demand is still insistent, and the Far East continue to be heavy buyers. The result of the Pyrogallic Acid case does not appear to have affected the price to any degree in respect of these products, for which import was prohibited.

### General Chemicals

ACID ACETIC remains strong and further advance is expected.

ACID OXALIC is in better supply, but English makers hold firmly to their price.

AMMONIUM SALTS remain active and firm.

ARSENIC continues in active request and the prices are a shade firmer.

BARIUM SALTS are active and a slight advance is again noted for Chloride.

COPPER SULPHATE is firmer, but trade light.

LEAD SALTS continue active and are firmer in price.

SODIUM CAUSTIC is in active demand at recent prices.

■ SODIUM PRUSSATE is again firmer and some good business has been done for export.

### Coal Tar Intermediates

There is no material change to report, and export licences are now being refused for many products, and business that would have otherwise been placed in England is being transferred to America.

ANILINE SALTS is practically unobtainable on the spot, and high prices are asked for Spring delivery.

BETA NAPHTHOL is also extremely scarce, and makers appear to be unable to cope with the demand.

### Coal Tar Products

There is little change to report from our last issue, and we close with a strong market for all products.

### Sulphate of Ammonia

There is no change to report.

## Current Prices

### Chemicals

	per	£	s.	d.	to	£	s.	d.
Acetic anhydride .....	lb.	0	2	9	to	0	3	0
Acetone, pure .....	ton	90	0	0	to	95	0	0
Acid, Acetic, glacial, 99-100% .....	ton	83	0	0	to	85	0	0
Acetic, 80% pure .....	ton	67	10	0	to	70	0	0
Carbolic, cryst. 39-40% .....	lb.	0	0	10	to	0	0	10½
Citric .....	lb.	0	4	3	to	0	4	4
Formic, 80% .....	ton	110	0	0	to	112	10	0
Lactic, 50 vol. ....	ton	70	0	0	to	72	0	0
Lactic, 60 vol. ....	ton	85	0	0	to	87	10	0
Oxalic .....	lb.	0	1	5½	to	0	1	6½

	per	£	s.	d.	to	£	s.	d.
Acid, Pyrogallic, cryst. ....	lb.	0	11	6	to	0	11	9
Tannic, commercial .....	lb.	0	3	6	to	0	3	9
Tartaric .....	lb.	0	3	2	to	0	3	3
Alum, lump .....	ton	19	0	0	to	19	10	0
Aluminium, sulphate, 14-15% .....	ton	15	0	0	to	15	10	0
Aluminium, sulphate, 17-18% .....	ton	18	10	0	to	19	0	0
Ammonia, anhydrous .....	lb.	0	1	9	to	0	2	0
Ammonia, 880 .....	ton	32	10	0	to	37	10	0
Ammonia, carbonate .....	lb.	0	0	7½	to	—	—	—
Ammonia, muriate (galvanisers) ..	ton	47	0	0	to	49	0	0
Ammonia, nitrate .....	ton	45	0	0	to	50	0	0
Ammonia, phosphate .....	ton	115	0	0	to	120	0	0
Arsenic, white, powdered .....	ton	65	0	0	to	67	0	0
Barium, carbonate, 92-94% .....	ton	13	0	0	to	14	0	0
Chloride .....	ton	22	10	0	to	23	0	0
Nitrate .....	ton	50	0	0	to	51	0	0
Sulphate, blanc fixe, dry .....	ton	25	10	0	to	26	0	0
Sulphate, blanc fixe, pulp .....	ton	15	10	0	to	16	0	0
Bleaching powder, 35-37% .....	ton	17	10	0	to	18	0	0
Borax crystals .....	ton	39	0	0	to	40	0	0
Calcium acetate, grey .....	ton	23	0	0	to	25	0	0
Chloride .....	ton	9	0	0	to	9	10	0
Casein, technical .....	ton	80	0	0	to	83	0	0
Cobalt oxide, black .....	lb.	0	7	9	to	0	8	0
Copper, sulphate .....	ton	42	0	0	to	43	0	0
Cream Tartar, 98-100% .....	ton	245	0	0	to	250	0	0
Epsom salts (see Magnesium sulphate)								
Formaldehyde 40% vol. ....	ton	175	0	0	to	180	0	0
Iron perchloride .....	ton	40	0	0	to	42	0	0
Iron sulphate (Copperas) .....	ton	4	10	0	to	4	15	0
Lead acetate, white .....	ton	84	0	0	to	86	0	0
Carbonate (White Lead) .....	ton	58	0	0	to	61	0	0
Nitrate .....	ton	62	0	0	to	63	0	0
Lithophone, 30% .....	ton	46	0	0	to	48	0	0
Magnesium chloride .....	ton	15	10	0	to	16	10	0
Carbonate, light .....	cwt.	2	15	0	to	3	0	0
Sulphate (Epsom salts commercial) .....	ton	11	15	0	to	12	10	0
Sulphate (Druggists') .....	ton	17	10	0	to	18	10	0
Methyl acetone .....	ton	89	0	0	to	90	0	0
Alcohol, 1% acetone .....	gall.	0	11	6	to	0	12	0
Potassium bichromate .....	lb.	0	1	6	to	0	1	7
Carbonate, 90% .....	ton	105	0	0	to	107	0	0
Potassium Chlorate .....	lb.	0	1	0	to	0	1	1
Meta-bisulphate, 50-52% .....	ton	245	0	0	to	260	0	0
Nitrate, refined .....	ton	60	0	0	to	62	0	0
Permanganate .....	lb.	0	3	6	to	0	3	9
Prussiate, red .....	lb.	0	6	3	to	0	6	6
Prussiate, yellow .....	lb.	0	2	0	to	0	2	1
Sulphate, 90% .....	ton	31	0	0	to	33	0	0
Salammoniac, firsts .....	cwt.	4	15	0	to	—	—	—
Seconds .....	cwt.	4	10	0	to	—	—	—
Sodium acetate .....	ton	49	0	0	to	50	0	0
Arsenate, 45% .....	ton	50	0	0	to	52	0	0
Bicarbonate .....	ton	10	10	0	to	11	0	0
Bisulphate, 60-62% .....	ton	32	10	0	to	33	10	0
Chlorate .....	lb.	0	0	6	to	0	0	6½
Caustic, 70% .....	ton	27	0	0	to	28	0	0
Caustic, 76% .....	ton	28	0	0	to	28	10	0
Hyposulphite, commercial .....	ton	19	10	0	to	20	0	0
Nitrite, 96-98% .....	ton	65	0	0	to	67	10	0
Phosphate, crystal .....	ton	37	0	0	to	38	0	0
Prussiate .....	lb.	0	1	1	to	0	1	1½
Sulphide, crystals .....	ton	16	0	0	to	16	10	0
Sulphide, solid, 60-62% .....	ton	25	10	0	to	26	10	0
Sulphite, cryst. ....	ton	11	10	0	to	12	0	0
Strontium, carbonate .....	ton	85	0	0	to	90	0	0
Sulphate, white .....	ton	8	10	0	to	10	0	0
Sulphur chloride .....	ton	40	0	0	to	42	0	0
Tin perchloride, 33% .....	lb.	0	2	5	to	0	2	6
Protochloride (tin crystals) .....	lb.	0	1	9	to	0	1	10
Zinc chloride, 102 Tw. ....	ton	22	0	0	to	23	10	0
Chloride, solid, 96-98% .....	ton	50	0	0	to	52	10	0
Sulphate .....	ton	21	0	0	to	22	10	0
Oxide, Redseal .....	ton	75	0	0	to	80	0	0



## Coal Tar Intermediates, &amp;c.

	per	£	s.	d.	to	£	s.	d.
Alphanaphthol, crude .....	lb.	0	3	0	to	0	3	6
Alphanaphthol, refined .....	lb.	0	3	6	to	0	3	9
Alphanaphthylamine .....	lb.	0	2	7	to	0	2	9
Aniline oil, drums free .....	lb.	0	1	5	to	0	1	6
Aniline salts .....	lb.	0	1	10	to	0	2	0
Anthracene, 85-90% .....	lb.	0	1	5	to	0	1	6
Benzaldehyde (free of chlorine) .....	lb.	0	6	6	to	0	7	0
Benzidine, base .....	lb.	0	7	6	to	0	8	0
Benzidine, sulphate .....	lb.	0	6	6	to	0	7	0
Benzoic acid .....	lb.	0	5	3	to	0	5	6
Benzoate of soda .....	lb.	0	5	3	to	0	5	6
Benzyl chloride, technical .....	lb.	0	2	3	to	0	2	6
Betanaphthol benzoate .....	lb.	1	6	0	to	1	7	6
Betanaphthol .....	lb.	0	2	9	to	0	3	0
Betanaphthylamine, technical .....	lb.	0	6	6	to	0	7	6
Croceine Acid, 100% basis .....	lb.	0	4	9	to	0	5	0
Dichlorobenzol .....	lb.	0	0	5	to	0	0	6
Diethylaniline .....	lb.	0	7	0	to	0	7	6
Dinitrobenzol .....	lb.	0	1	2	to	0	1	3
Dinitrochlorobenzol .....	lb.	0	1	2	to	0	1	3
Dinitronaphthaline .....	lb.	0	1	4	to	0	1	6
Dinitrotolual .....	lb.	0	1	7	to	0	1	8
Dinitrophenol .....	lb.	0	1	3	to	0	1	6
Dimethylaniline .....	lb.	0	3	0	to	0	3	3
Diphenylamine .....	lb.	0	3	3	to	0	3	6
H-Acid .....	lb.	0	11	6	to	0	12	6
Metaphenylenediamine .....	lb.	0	4	9	to	0	5	0
Monochlorobenzol .....	lb.	0	0	9	to	0	0	10
Metanilic Acid .....	lb.	0	7	6	to	0	8	6
Monosulphonic Acid (2:7) .....	lb.	0	7	0	to	0	8	0
Naphthionic acid, crude .....	lb.	0	3	6	to	0	3	9
Naphthionate of Soda .....	lb.	0	4	3	to	0	4	6
Naphthylamin-di-sulphonic-acid .....	lb.	0	4	6	to	0	5	0
Nitronaphthaline .....	lb.	0	1	2	to	0	1	3
Nitrotolual .....	lb.	0	1	3	to	0	1	6
Orthoamidophenol, base .....	lb.	0	18	0	to	1	0	0
Orthodichlorobenzol .....	lb.	0	1	1	to	0	1	3
Orthotoluidine .....	lb.	0	2	2	to	0	2	3
Orthonitrotolual .....	lb.	0	1	6	to	0	1	9
Para-amidophenol, base .....	lb.	0	14	0	to	0	15	0
Para-amidophenol, hydrochlor .....	lb.	0	15	6	to	0	16	0
Paradichlorobenzol .....	lb.	0	0	4	to	0	0	5
Paranitraniline .....	lb.	0	4	0	to	0	4	6
Paranitrophenol .....	lb.	0	1	0	to	0	2	0
Paranitrotolual .....	lb.	0	5	3	to	0	5	6
Paraphenylenediamine, distilled .....	lb.	0	12	0	to	0	13	0
Paratoluidine .....	lb.	0	7	0	to	0	7	6
Phthalic anhydride .....	lb.	0	9	0	to	0	10	0
R. Salt, 100% basis .....	lb.	0	4	0	to	0	4	2
Resorcin, technical .....	lb.	0	11	0	to	0	12	0
Resorcin, pure .....	lb.	1	7	6	to	1	10	0
Salicylic acid .....	lb.	0	2	9	to	0	3	9
Salol .....	lb.	0	4	9	to	0	5	6
Shaeffer acid, 100% basis .....	lb.	0	3	6	to	0	3	0
Sulphanilic acid, crude .....	lb.	0	1	4	to	0	1	6
Tolidine, base .....	lb.	0	9	6	to	0	10	6
Tolidine, mixture .....	lb.	0	2	9	to	0	3	0

## Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 4, Queen Anne's Gate Buildings, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

LOCALITY OF FIRM OR AGENT.	MATERIALS.	REF. NO.
Czecho-Slovakia...	Asbestos Products ... ..	1,258
Germany (Frankfort-on-Main)	Chemical Products, Drugs, Fats and Oils, Metals, &c.	1,260
Germany (Cologne)	Soap ... ..	1,261
Africa (Fez) ...	Glass, Metal Goods ... ..	1,270
Venezuela (Guaira)	Window Glass ... ..	1,275

## Protection in the English Dye Industry

THE need for protection in the English dye industry was emphasised at a meeting of the Ossett (Yorkshire) Chamber of Commerce last week, at which the provisions of the Imports and Exports Regulation Bill were discussed. Mr. H. Wade presided.

It was proposed by Mr. J. Ward that the Chamber should support the Bill in its entirety. Touching on the need of protection for the dye industries, he expressed his conviction that given the opportunity, and if research work were carried out on proper lines, this country would be able in a very few years to produce dyes as well as Germany.

Mr. W. A. Taylor, in seconding, observed that in creating a monopoly of the dye industry Germany had practically looked upon dyes as a by-product, and had recouped herself by the valuable chemicals extracted in the process of dye-making. He mentioned the evil effects of dumping on the Heavy Woollen District in Yorkshire some years ago, when Germany purchased yarns, &c., here, and afterwards returned manufactured cloth at a price below that at which we could sell.

Mr. G. H. Wilson thought that the time was not ripe for any restrictions on imports and exports, and that the measure would have a tendency to increase prices, and would probably lead to party strife. The safeguards proposed in the Bill, he felt, were of a bureaucratic kind, and were left to the discretion of a very few men.

Mr. B. P. Wilson described the Bill, which he said was not a party measure, as the greatest instrument ever devised for the welfare of the country. It contained adequate safeguards for every contingency, and should be passed in its entirety.

The President also supported the resolution, and, alluding to the importance of fostering the dye industry, remarked that of the 400 tons of dyes recently imported from Germany, 200 tons consisted of a colour which could be produced in large quantities within a few miles of Ossett.

Eventually a resolution in favour of supporting the Bill was carried by a large majority.

## The New Chemical Co., Ltd.

A PETITION for the winding up of the above-named company was presented on December 11 to the County Court of Lancashire by the Clayton Aniline Co., Ltd., of Chatham Street, Clayton, Manchester, and the petition is directed to be heard on January 12, 1920, at 10.15 a.m.

## Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

## London Gazette

## Liquidator's Notice

THE RUBEL BRONZE AND METAL CO., LTD.—A general meeting of members will be held at 82, Victoria Street, London, S.W. 1, on Monday, January 26, 1920, at 12 noon. Harry S. Foster, Liquidator.

## Situations Vacant.

(Three lines, 3s.; each additional line, 1s.)

Unless specially asked for, Original Testimonials should NOT be forwarded with Applications, but only copies of the same.

**CAPABLE AND EXPERIENCED WORKS ANALYST** required to take entire charge of Works Laboratory. Previous experience in Laboratory Control and Superintendence of Chemical Staff is essential, in addition to a thorough Chemical training. A knowledge of Brewing and Sulphite work would be a recommendation. Full replies are invited, stating when disengaged, age and salary required, to Box No. 41, CHEMICAL AGE Offices, 8, Boulevard St., E.C.4.

## For Sale or Wanted

(Three lines, 3s.; each additional line, 1s.)

**WANTED.—LEAD**, remelted in pigs or ingots. Also Lead Ashes, Slags, and Skimmings. Prompt cash terms.—SPOONER, SON & CO., 214, Bishopsgate, London, E.C.2. Telephone: London Wall 5959. Telegrams: "Spooneral, London."

**SPECTROSCOPES, MICROSCOPES**, bought, sold, and exchanged. List free.—JOHN BROWNING, 146, Strand, W.C.

**WANTED.**—CAST IRON PAN, 4'0" diam × 4'0" deep fitted with Lid. Agitators and Gearing with round bottom and outlet cast in one piece with pan. suitable for fire or gas heating.

Cast Iron or Steel Jacketted Shallow Evaporating Pans. 50/100 gallons capacity. concave in shape. without any outlet holes or lid. suitable for 50/60 lbs. steam pressure in jacket.—Reply with full particulars and price, to Box 40. The CHEMICAL AGE Offices, 8, Bouverie Street, E.C. 4.

### Situations Wanted.

(Twenty-seven words, 2s.; every additional 9 words 6d.)

**CHEMIST WITH HIGH QUALIFICATIONS** [Ph.D.

Ph.Ch.] and large experience as Analytical and Pharmaceutical Chemist, speaking many languages. wants situation in London.—Apply to P.G., Strand Palace Hotel, Room No. 885, Strand 371, London, W.C.2.

### Notices

(Three lines, 3s.; each additional line, 1s.)

**CHEMICAL PATENTS, INVENTIONS, or TRADE MARKS** Advice and handbook free. Write K1 G'S PAT NT AGENCY, Ltd. 165, Queen Victoria St., E.C. 4; or 'Phone Central 268.

### Partnership.

(Three lines, 3s.; each additional line, 1s.)

**CONSULTANT CHEMIST**, fully qualified and experienced, seeks partnership in Established Firm; has reasonable connection; specialized in Water Supply Bacteriology and Chemical Engineering; in practice 3 years pre-war.—Box No. 37. CHEMICAL AGE Offices, 8, Bouverie Street, E.C. 4.

### TULLY'S PATENT BLUE WATER GAS PLANT

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See Advt. in last week's issue

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